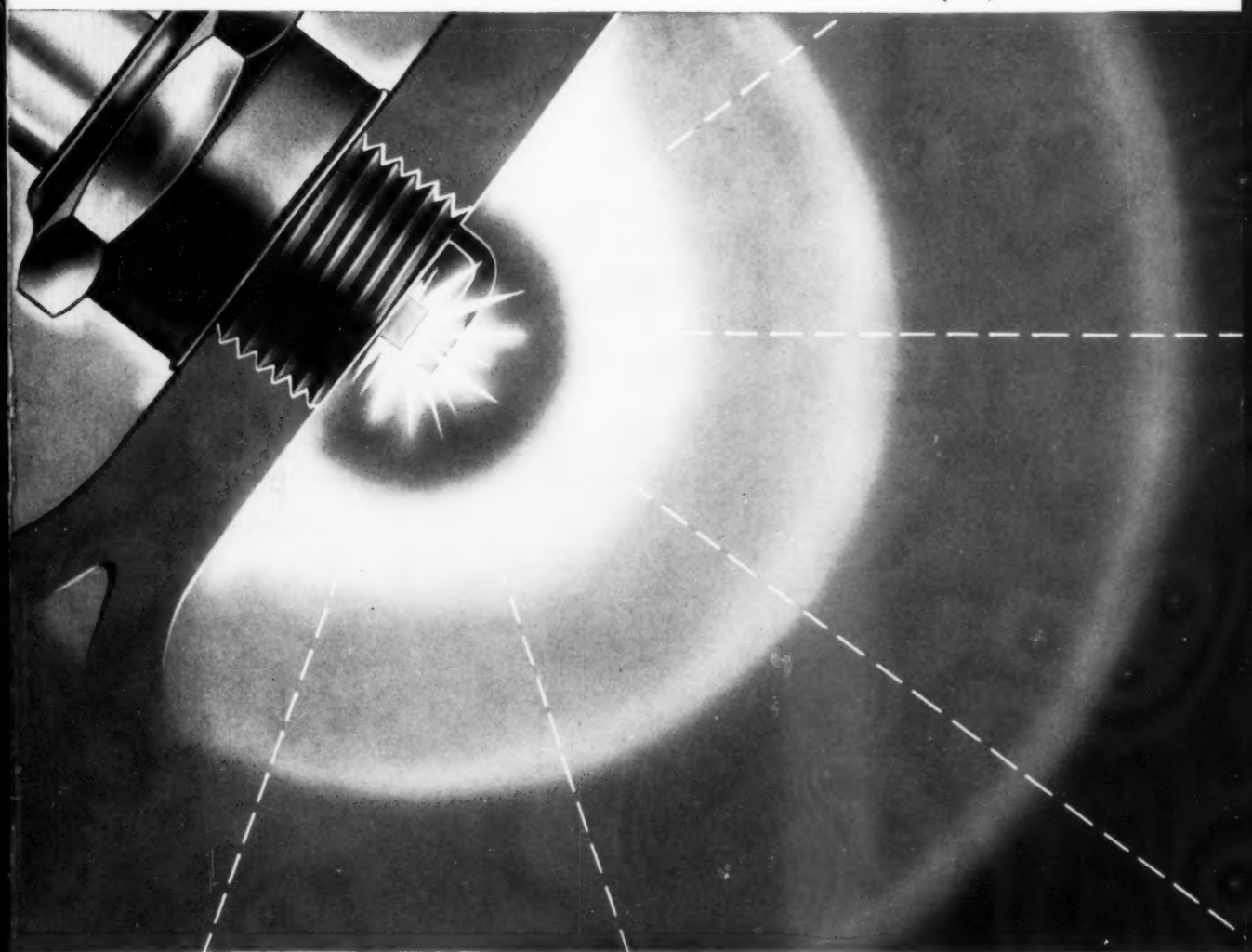
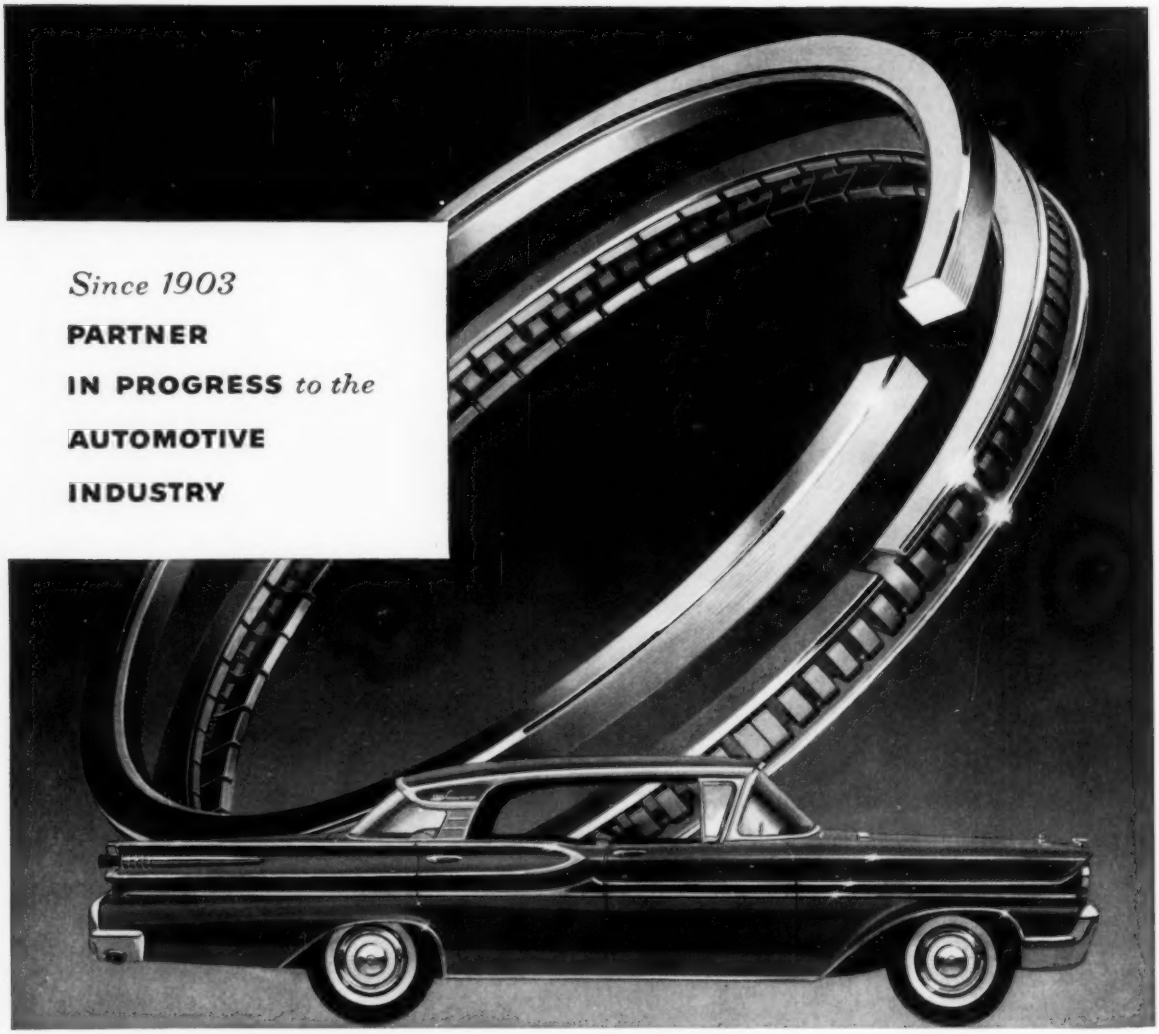
Automotive Service Digest

Our 46th year

April, 1958



Power Starts with a Spark—See Page 14.



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PERMATEX PETE AND TOON-OYL SAVE THE DAY!
SEE WHAT YOU CAN DO, BILL
SOUNDS ROUGH, MR. WILSON, BUT WE'LL HAVE IT FIXED IN A JIFFY!
PING! PING! PING! PING! PING!
THAT TAKES CARE OF THE MECHANICAL ADJUSTMENTS. NOW WE'LL GET RID OF THE CARBON AND VARNISH DEPOSITS YOU'VE BUILT UP.
AND THAT'S A JOB FOR PERMATEX TOON-OYL.
LISTEN TO THAT ENGINE START TO PURR. BOY, THIS TOON-OYL GOES TO WORK FAST!
AND KEEPS ON WORKING TOO!
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BESIDE THE MECHANICAL ADJUSTMENTS, I USED PERMATEX TOON-OYL... PERMATEX HAS BEEN MAKING TOP QUALITY AUTOMOTIVE CHEMICALS FOR ALMOST 50 YEARS!
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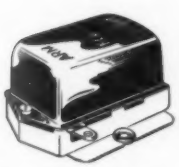

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VISION-AID HEADLAMPS — In 1907 Tung-Sol produced the first successful electric headlamp . . . today Tung-Sol Vision-Aid Headlamps—both standard 7" and new duals—enjoy an outstanding reputation for rugged, dependable service. They take the toughest road conditions in stride and deliver long, brilliant service . . . the kind of service that keeps your customers sold on you.

DUAL VISION-AIDS
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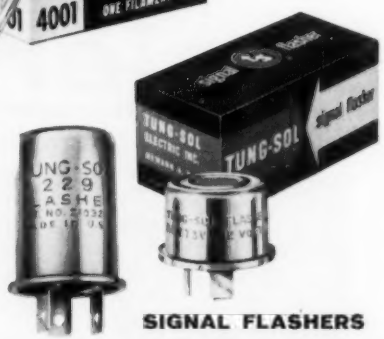
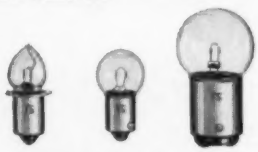


SIGNAL FLASHERS

1939 was the year Tung-Sol manufactured the first flasher ever to appear on the American highway. Today—100,000,000 flashers later—every car and truck manufacturer specifies Tung-Sol as initial equipment. Whatever the requirement, there's a Tung-Sol flasher to deliver dependable, lengthy service: direction signal flashers, alternating flashers, external, interior and vehicular disability warning signals.



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From bumper to bumper and floor to dome—whatever the application—there's a Tung-Sol miniature lamp that fills the lighting requirement—efficiently, dependably. For both 6 and 12-volt systems. Stock Tung-Sol—the complete line of miniature lamps.

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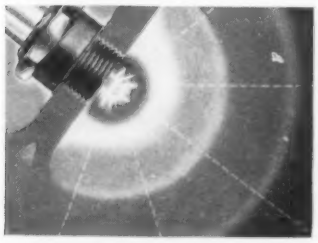

Cover

Without the blue-white pulse of the spark plug, the modern high-speed, high-power car engine is as dead as the Dodo bird.

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For May

● After you have finished reading the article "So You Want to Open a Service Shop," beginning on page 20 of this issue, we're sure you will be looking for article No. 2, in the May issue, covering this all-important subject. Going into the automotive service business for oneself can be both profitable and interesting. You have to know cars and understand people, because schooling in mechanics often must be mixed with applied psychology.

● Been waiting for our transmission series to cover the technical and servicing dope on the Dynaflow? Well, you'll be rewarded, because the May issue will give you the complete story, with plenty of good pictures.

● May is the month of tuning-up for touring. So in tune with the times—and robins—we're giving our readers a dandy article on making engines really sing.

Automotive clinic

Stuck on some problem? Need help on a job? Write us about your problem on your shop letterhead and the information you are looking for will be promptly sent you.

Address your letter to Automotive Clinic c/o AUTOMOTIVE SERVICE DIGEST, 900 S. Wabash Ave., Chicago 5, Ill.

Ben Ikert, Editor

Valves Burn and Warp

I was interested in the problem of J. P., Hardwick, Minn., who is being plagued by valve burning and warpage on two L.P.G. engines. Since I have worked with these conversions since 1941 I might be able to help him a bit.

The primary trouble that brings about the conditions he mentions (Automotive clinic, ASD December, 1957, page 8) is that the valve seats wear, thus tightening the tappets. This can occur in 10 hours or less of operation after a valve job. These engines should all have hard seats for L.P.G.

Valve rotators are great, but without hard seats for the valves, they will only amplify the trouble. I have found this true of all engines, more or less, but particularly on the '49 Mercury and '54 Ford industrial engines mentioned by your clinic inquirer.—*L.M., Hollis, Oklahoma.*

Using A Burette Gauge

Can you tell me how to use a Bendix Burrett Gauge? I would like to know if this tool is used to measure the number of cc's the accelerating pump puts out?

Also, I would like to know how to check an economizer, as used on Ford carburetors. Are special tools necessary?—*E.C., Richmond, Va.*

Answer: A burette is a device for measuring small quantities of liquid. It has a petcock on the bottom and a scale on the container so that the amount of liquid that runs out can be measured. It can also be used to collect small amounts of liquid and measure the amount, usually in cc's (cubic centimeters).

The best way to check on the action of the economizer on any carburetor is to use a combustion analyzer to see that each of the carburetor circuits is functioning properly. As far as we know, no special tool is necessary to work on Ford carburetors.

Engine Will Not Idle

We service a 1956 Olds 88 which has been driven about 25,000 miles. It has a Hydra-Matic transmission and Rochester 2GC carburetor. The carburetor will not hold its idle adjustment for more than a few days. That is, the engine stalls and the owner must adjust one or both idle screws to get going. We have tried everything, but to no avail. Perhaps you have suggestions to help in overcoming this difficulty.—*H.E., New York, N.Y.*

Answer: The following points should be checked and corrections made if deviations are found. It is assumed that you have made a complete ignition check, but if not, do this before performing items No. 2 and 3.

1—The throttle linkage should be checked to be sure that the idle r.p.m. is controlled by the fast idle screw on the carburetor and not by a bind or a mechanical stop in the linkage.

2—There is a distinct possibility that foreign material is entering the fuel system causing a creeping fuel level. The needle and seat should be inspected and the float assembly checked for possible burrs causing binds, as well as checking for proper alignment and correct float settings.

3—The idle circuits of the carburetor should be thoroughly cleaned to be sure there are not floating dirt deposits which lodge on the needle requiring an adjustment to compensate and then they subsequently move allowing enrichment.

4—In the event the above steps do not correct the condition, the engine should be thoroughly checked for sticking valves.

Valve Spring Breakage

Every once in a while we get an engine with the darndest noise in it. On investigating, we find that it's usually due to a broken valve spring. Seems like we get more than our share of this trouble. Can you give us any ideas as to what makes valve springs break?—*V.S.B., Louisville, Ky.*

Answer: There are many possibilities. The following list gives the more likely causes:

- Spring cocked — not assembled correctly.
- Spring ends not parallel and square with axis.
- Shimmy or flutter at high speeds.
- Dampener not correctly assembled.
- Sludge between coils formed in valve compartment, due to overoiling, excessive heat, or improper ventilation.
- Moisture in valve compartment combined with heat crystalizes spring material.
- Acid etching spring surface.

Replacing the Folo-Thru

As a mechanic who is trying to be conscientious, I like to have some official guide for deciding when a Folo-Thru Bendix drive needs replacing. If my customer needs a new drive I certainly want to sell it to him. On the other hand, I'd appreciate your remarks so that I don't "barber shop" anyone.—*B.D.R., Milwaukee, Wis.*

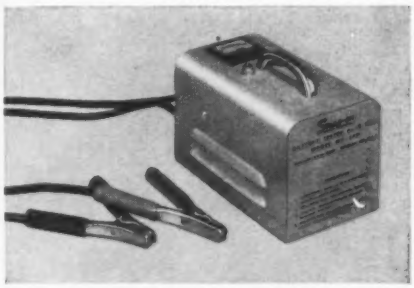
Answer: The Folo-Thru Bendix drive is designed to stay in mesh with the flywheel until the engine runs at a moderately fast idle. This feature prevents "kicking out" with false starts. With the old type drive there is danger of breaking flywheel teeth if cranking is resumed too soon after such a false start.

Two spring-loaded detent pins are used in the Folo-Thru drive. One of these keeps the pinion in the demeshed position until the starter is energized. The other keeps the pinion in the meshed position until the engine starts. If dirt, gum, or heavy oil prevent free operation of the anti-drift detent, the drive may not engage or it may drift. Failure to engage is easily identified by testing the starter action on the engine. Drifting is indicated by burred or cracked edges

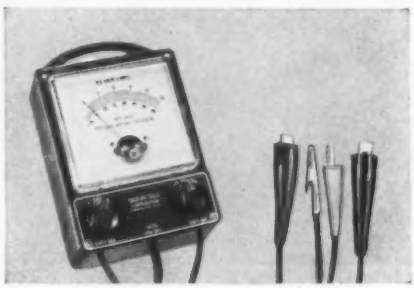
(Continued on page 10)

Boost Battery Sales and Generator Service Profits

WITH THESE Snap-on* TESTERS



MT-340 BATTERY TESTER — for six and twelve-volt systems. Automatic relay system selects the proper voltage — eliminates placing injurious load on battery being tested. Unit performs three important tests: Open Circuit Test shows battery condition and no-load voltage . . . Load Test measures battery's capacity to deliver sufficient power for 30 seconds . . . Regulator Test shows if regulator is functioning properly to recharge battery.



MT-401A GENERATOR-REGULATOR METER — tests the generator, checks regulated amperes, cutout and regulated voltage, locates electrical leaks — from one fast-reading dial. Tester has 15-volt range for standard ignition and 60-volt range for heavy-duty systems.

COMBINATION	
MT-340 battery tester MT-401A generator-regulator meter	$9.00 down $3.42 per week Price subject to change without notice.

JUMP your battery sales — boost generator-regulator servicing with these *Snap-on* tools. Easy-to-use battery tester does a complete check in 60 seconds. You can test every battery that comes in — show customers which have failed and which are about to fail. Generator-regulator tester has voltage range to handle any car and most trucks in service today.

Your *Snap-on* man will demonstrate — and point out the profit potential in these tools. Get them on the *Snap-on* easy payment plan that lets you buy now — pay later.

Ask about Whitworth and Metric tools for servicing foreign cars.

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"I'm from Missouri," said the mechanic...

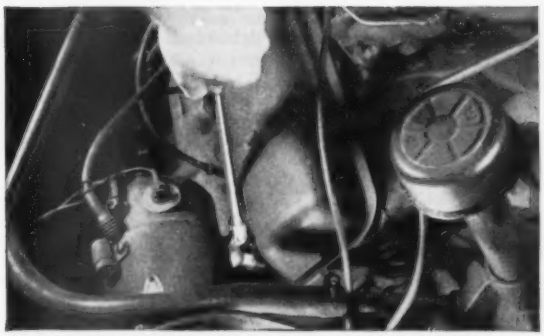
"Show me how this new Champion wrench

1. The mechanic was mad. He had just burned his knuckles while freeing a plug. "I'd sure like a wrench that could save my hands. Let's see what yours can do."

That challenge came when the mechanic heard about the new "Plug-Master" wrench... an exclusive development of the Champion Spark Plug Company. And the Champion representative showed him. Like this.

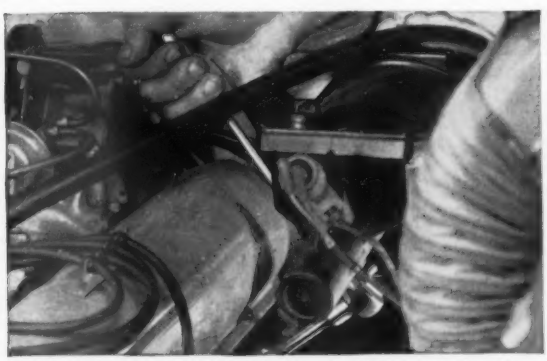
2. "Right," said the Champion man. "Watch how this flex-handle bends back to let me keep my hands up above a hot manifold. The 'Plug-Master' is a real knuckle-saver."

makes spark plug jobs easier and faster!"



3. **"Not bad,"** said the mechanic. "What about a plug buried behind a generator?" "Just like this," was the answer. "The handle bends back and you've got no problem."

4. **"See how it clears this valve cover,** so you can work up in the open without banging your knuckles." "That's great," said the mechanic. "But what about power equipment?"



5. **"OK, look here.** See how, with an extension, you can get in behind this power-brake master cylinder. There isn't a single plug job that this wrench doesn't make easier and faster."

6. **"You've sold me,"** said the mechanic. "I'd like to have a couple of those 'Plug-Master' wrenches. How do I get them?" For the answer to that, see box below.

● The "Plug-Master" ratchet wrench is available from your wholesaler in any one of four assortments of 50 fast-moving Champion plug types. (One for the over-all car market, others specifically selected for Ford Motor Company, General Motors, or Chrysler Corporation cars.) Packaging in these assortments enables you to obtain this new wrench at the low price of $4.25.*

The "Plug-Master" has a hinge joint that permits 30° handle travel forward or backward. Full 12-tooth ratchet engagement. Only 6° handle travel required for next bite. Popular 3/8" square drive fits most spark plug sockets and extensions. Ratchet shift reverses easily—has positive-locking action.

**Suggested dealer price for wrench only. Assortment of 50 Champion plugs at regular dealer price. (Minimum dealer price established by Fair Trade Agreements in Fair Trade States.)*

Dependable 5-rib

CHAMPION

SPARK PLUGS

CHAMPION SPARK PLUG COMPANY • TOLEDO 1, OHIO

on the pinion teeth. If the drive remains engaged too long after the engine starts, it may indicate that the second detent pin is sticking. This complaint requires careful consideration of what "too long" really is.

It is important that the drive remain engaged until the engine operates at a *moderately fast idle*. The operator's starting habits must be analyzed to decide this point.

Actual sticking of the drive in the meshed position results in burring of the ratchet-type overrunning mechanism and/or throwing of the armature windings due to high rotative speed. This throwing may be slight. So it's a good idea when deciding on the performance of the drive to compare the armature windings of the starter with those of a similar armature.

On the basis of the foregoing you can determine whether the drive should be replaced or not.

Vacuum Path

Can you tell me the path vacuum takes from the manifold to distributor vacuum assembly on a '56 Ford Fairlane with 4-barrel carburetor and dual vacuum distributor unit.

Recently I renewed the vacuum unit on this car, cleaned passage lines in the carburetor and connecting tubing. The car performs much better, but not to my complete satisfaction. —*S.M., Raynham, Mass.*

Answer: The vacuum path you mention is quite simple to follow. The vacuum from the carburetor simply goes to the vacuum spark control on the distributor, this vacuum being much lower than manifold vacuum. It comes from specially drilled passages in the carburetor.

The secondary vacuum diaphragm is directly connected to the intake manifold and is used merely to provide rapid control of the ignition timing to retard it more rapidly during the initial acceleration period. This diaphragm functions during the period that the vacuum acting on the primary spark control diaphragm is normalizing to the vacuum provided by the carburetor during acceleration. The 1957 Ford products went back to the automatic plus vacuum advance.

Powerglide Leakage

I am having trouble with front pump oil seal leakage on a '56 Powerglide. Have serviced the unit four different times, but within a short time, the unit starts to leak again.

When first taken out the oil seal seemed to be okeh. I put in a new front pump, but this did not eliminate the condition. Is there more than one type of front pump oil seal? The transmission does not give a bit of trouble in any other way.—*C.B.S., Christiana, Pa.*

Answer: It occurs to us that maybe the leak is from the rear bearing of the engine rather than the transmission. This can be easily checked by putting a dye in the transmission oil. If the color shows up at the leak, it shows definitely that the leak is from the transmission. If there is no color, the leak is at the engine.

If you find it is the transmission that is leaking, and take it off again, check carefully for scratches or burrs that could affect the seal.

Timing the Ignition

I have been reading over several back issues of A.S.D., and notice that more and more tune-up men are making it a practice to disconnect the distributor vacuum line when timing an engine.

I service all makes of cars and remove the distributor on all point jobs. I use the A.E.A. tune-up card system, but note that on some cars they say "disconnect" and on others "don't disconnect." Some cars have ignition marks and others have T.D.C. plus degree markings. If we disconnect the vacuum line on all of them, what do we go by?—*R.F., Blackwell, Okla.*

Answer: In all cases where the ignition timing is to be set with the engine at idle speed, the vacuum advance line to the distributor *should be disconnected*, whether manufacturer specifies this or not, as the factory at idle speed presupposes no advance from either the automatic advance or the vacuum advance at this time.

In some cases on the newer cars, the ignition timing is specified to be set at a certain engine speed, such as 900 r.p.m., and in this case the vacuum line should not be disconnected because the specification takes into account some advance at the specified speed. This assumes that the distributor will perform according to its specifications as to its vacuum advance curve and automatic advance curve.

Whether the flywheel timing marks or vibration damper marks are given in degrees or timing marks, follow the specifications for each car, as this information will be in accordance with the timing marks for that car. And don't advance the timing more than specified even if the owner asks you to, as it can cause serious trouble due to detonation, unless you power-time on a dynamometer.

Gremlins That Cause Engine Overhaul Failure

Generally we do pretty well on our engine work. And just as we think we're getting pretty good, along comes a comeback that hurts. Please don't use our name, but if you can tell us why one cylinder rebore job stands up and the next one fails, we'd be grateful to you. We think we know the fundamentals the same as you do. But a "gremlin" creeps in once in a while and knocks our reputation for a loop.

So if it wouldn't be too much trouble, perhaps you could give us the reasons for failure in what appears to be a darned good rebore job.—*(Name omitted by request)*

Answer: We're not too sure that we know all the answers either, but we've got a lot of friends who do—and these friends include factory engineers as well as skilled mechanics.

Through the years we've published a lot of reasons why apparently good engine overhaul jobs go wrong. Here are some of them. We hope they prove helpful.

Cylinder bores not at 90° to crankshaft.
Pistons not in alignment with cylinder bores.
Misaligned connecting rods or piston pins.
Poorly fitted piston pins.
Cylinder bore not true or parallel throughout length.

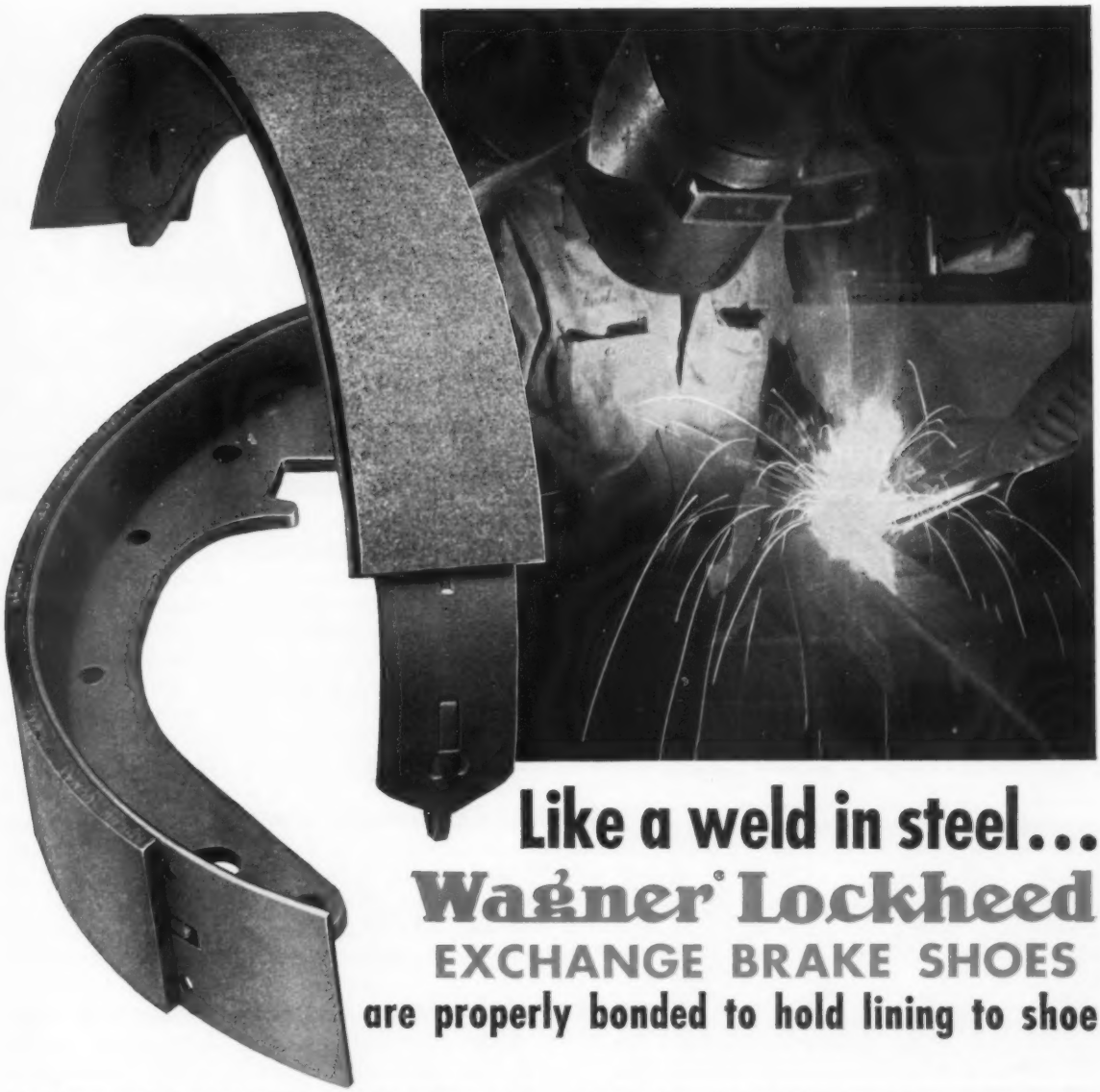
Improper piston clearance.
Ring gap clearance too small, causing excessive cylinder wall pressure.
Cylinder warpage or distortion due to clogged water jacket.
Unequal tightening of cylinder head causing distortion.

Warped valve seat distorting cylinder bore.
Cylinder walls lack smoothness and wear rapidly.
Overheating and uneven cooling—adding cold water suddenly.
Lack of, or ineffective lubrication.

Watery, dirty, diluted, or inferior oil being used.
Failure to remove abrasive dust and thoroughly wash cylinder bore.
Scale and sediment in water jackets causing uneven cooling and local hot spots.

Poor igintion or faulty carburetor adjustment.
Excessive use of manually controlled choke by driver or sticking, automatic choke.
Cylinders finished too smoothly.
Piston skirts need bevel relief—starving rings.

To make your shop more profitable ... your time more valuable ... be sure to read this month's "These Are New" section.



Like a weld in steel...

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EXCHANGE BRAKE SHOES

are properly bonded to hold lining to shoe

The Wagner method of applying lining to shoes makes sure that the two are *properly* bonded—holding the lining to the shoe as securely as the weld in fabricated steel.

When you exchange shoes, you take full advantage of our mass production facilities—the slow, tedious delining and relining is done for you. You save time on every job . . . speed turnover . . . and gain time for other profitable work.

Wagner supplies you with clean, inspected, completely reconditioned shoes equipped with the right premium quality lining to insure customer satisfaction—and the price enables you to make a substantial profit.

WAGNER EXCHANGE BRAKE SHOES have lining "bonded-on" or "riveted-on" according to highest factory standards. Sets are available for all cars and some light trucks with both standard and oversize lining thicknesses.

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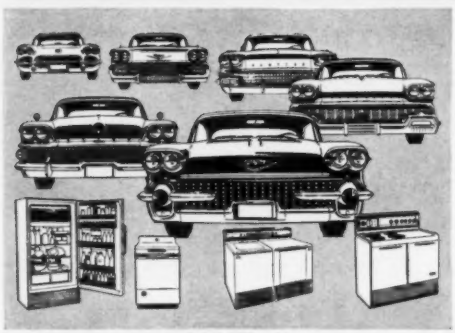

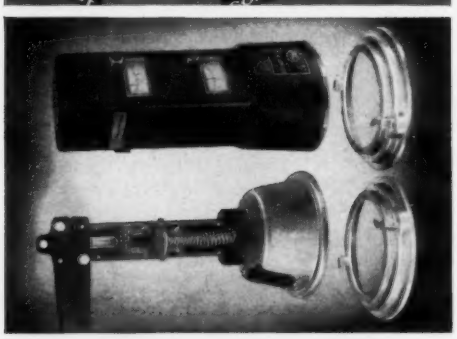

ANY LICENSED DRIVER IS ELIGIBLE! General Motors is conducting a $100,000 AIM TO LIVE Contest during March and April to create greater interest in night-driving safety and to stimulate action on the part of motorists to have their headlights checked and properly aimed. This is a wonderful opportunity for you. Most of your regular customers will want to enter. And there'll be plenty of *new* customers, too! For any licensed driver is eligible to win one of 116 valuable prizes including 16 new 1958 General Motors cars and 100 beautiful Frigidaire appliances. *And they can only enter at an AIM TO LIVE Headquarters.*

HEAVY NATIONAL PROMOTION BUILDS TRAFFIC FOR *YOU!* This contest is being promoted in a nation-wide magazine, television and publicity program, inviting motorists to stop at your AIM TO LIVE Headquarters for an official entry blank. And when motorists drive into your AIM TO LIVE Headquarters, you have an excellent opportunity to check their headlights for replacement and proper aiming.

GET FREE PROMOTION MATERIAL WORKING FOR *YOU!* This colorful display material gives you a strong tie-in with national advertising and clearly identifies you as an AIM TO LIVE Headquarters. In addition, it's a constant reminder to your customers to have their headlights properly aimed at least twice a year.

HAVE YOUR AIMERS AND AIMING STATIONS READY! Get set to handle all the business coming your way through the AIM TO LIVE program. Have your aimers and stations ready with qualified men to do the aiming. If you have not been contacted directly about AIM TO LIVE, call your authorized General Motors dealer or AC Guide Lamp Supplier for full details *right now!* Contest closes April 30th.

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Editor's page

Opening your own service shop?

• BEGINNING IN THIS issue, AUTOMOTIVE SERVICE DIGEST brings to the readers a "Business Know-How" series. This new editorial material is expressly designed to help a man decide whether or not he has the qualifications to establish his own service shop.

Also, this important undertaking on the part of ASD will elaborate on coping with the new responsibilities that will be thrust on the shoulders of one going into business for himself.

The editors feel this comprehensive series, aside from being of inestimable value to those already operating their own shop, will bring into sharp focus the answers to two important questions that the mechanic still in the "running-my-own business" dream stage, must answer:

1—Will he be better off to maintain a *status quo* and continue working for someone who owns and manages a shop?

2—Does a critical self-analysis clearly indicate that he has "what it takes" to run his own business, with all that it implies in ability to meet people and apply the tried-and-proved management techniques used by successful business concerns?

A star baseball player once interviewed by a TV commentator, said that, aside from the monetary reward, "you really have to like baseball to stay in it as long as I have." His comment might well be that of countless others who feel the same way about the diverse businesses in which they are engaged. A universally accepted business axiom—perhaps the number 1—is, you should like the business you're in.

Liking the business you're in may apply to working for some company, large or small; for national or municipal government; an individual, or—as many would like—being in business for yourself.

At some time or other during their life span, lots of people get the urge to go into business for themselves—often a mighty big jump from the work they are doing. True enough, there are not many jobs that have the zest, thrill, satisfaction and challenge of being the owner and operator of one's own business.

But it's not all "honey and spice and everything nice." Many who have set themselves up in business, only to learn they lacked managerial ability, will attest to this.

As the co-authors of our Business Know-How series state in the article beginning on Page 20, the ever growing number of motor vehicles, plus the shortage of service personnel, appears to point to an independent shop as one of the most lucrative of all small businesses. Hence, many capable mechanics see the beckoning hand luring them into running their own shop.

Once the mechanic is on his own, there's more than doing good mechanical work. This ability must be supplemented equally with managerial efficiency—not an easy job. However, it's not impossible, considering the thousands of independent service shops making a go of it.

Ben Ikert
EDITOR

Power starts with a spark

Few automotive parts are called upon to take the brutal punishment meted out to spark plugs—yet expected to perform without fail or impairment. Skilled service personnel should understand the "inside cylinder" story.

• OVER THE YEARS there has been a steady increase in engine compression ratio, bringing with it a progressive increase in horsepower and overall car performance. We speak of modern engines as "packed with power," engines that rev up to speeds associated with race car engines only a few years back.

Yet given an engine of excellent design, plenty of piston displacement, high compression ratio and equipped with the finest fuel control system, it becomes dead as a dodo bird if deprived of the all-important high tension spark that triggers the potential performance waiting to be unleashed in the cylinder combustion chambers.

To be sure, gasoline is the working medium without which no conventional passenger car engine can run. Compression pressure is mandatory to squeeze the air-fuel mixture for imparting "oomph" into the power thrusts of the pistons. But, unless there's the vital spark of required intensity at the exact instant in each combustion chamber, there's either no performance, or at best poor performance. So, let's face it—all engine power starts with a spark.

Even with poor fuel, or a poorly functioning carburetion system and with low cylinder compression, an engine will run after a fashion, but without a spark—*never*.

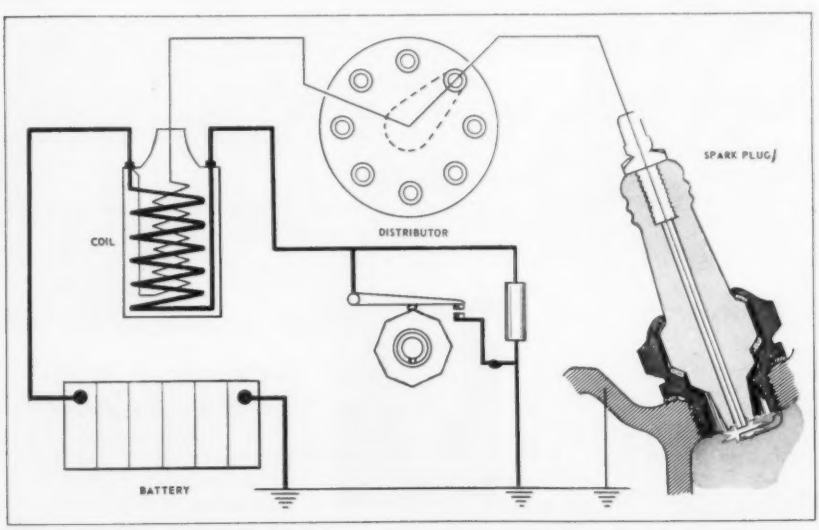
The business end of the mechanical set-up for repeatedly producing sparks to ignite the combustible charge in the cylinder is, of course, the spark plug. The plug must introduce high tension ignition current, well insulated, into the combustion chamber; and must initiate the combustion of compressed air-fuel mixture by a spark passing through the gap existing at the spark plug electrodes.

Along with the developments and improvements to obtain greater performance and economy of motor cars, have come greater electrical, mechanical, chemical and—most important—thermal demands on spark plugs. And, research, experimentation and development work goes on.

Depending on the make and type of engine, gas temperatures and pressures in the four-stroke cycle engine rise, after ignition, to between 3600 and 5400 deg. F., and 570 to 710 psi.

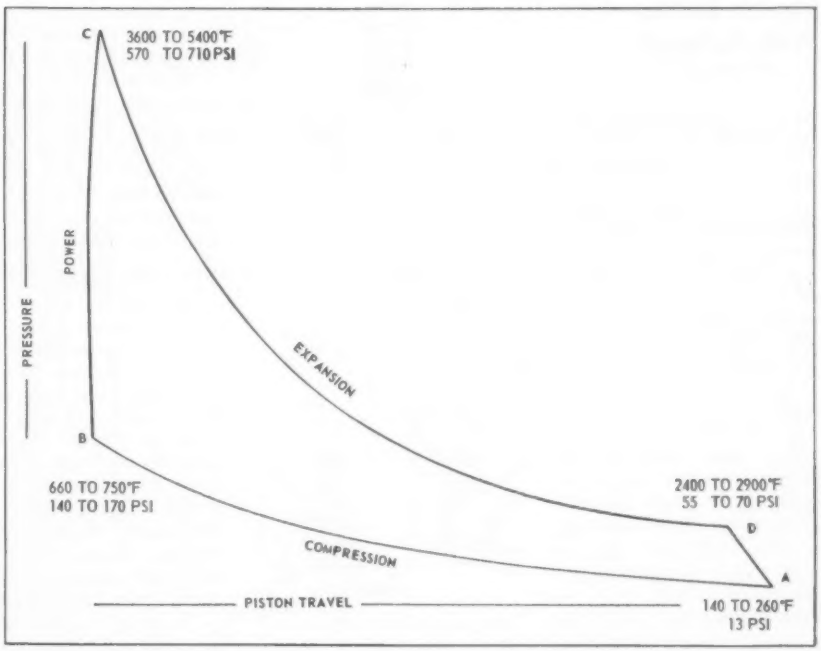
As shown at A, in the illustration, the existing temperature at the time of intake valve closing may be 140 to 260 deg. F., and the pressure 13 psi. At the end of the compression stroke, B, the temperature and pressure may be on the order of 660 to 750 deg. F., and 140 to 170 psi., respectively.

Ignition takes place at B (end of compression stroke



Shown schematically in this diagram is a high-voltage pulse which is delivered across the spark plug gap by a supply system made up of a battery (or generator), coil and distributor.

By GUY F. WETZEL
Technical Editor



Temperatures and pressures to which spark plugs are subjected in the operation of a four-cycle gasoline engine, according to type, compression ratio and rotational speed.

or slightly before) and the temperature-pressure rise, C, for an instant is tremendous, possibly up to from 3600 to 5400 deg. F., and 570 to 710 psi. Temperature and pressure drop on the expansion stroke to 2400 to 2900 deg. F., and 55 to 750 psi., respectively at point D, where the introduction of the relatively cool, fresh air-fuel mixture, through the inlet valve, drops the temperature and pressure still lower to readings shown at A, where the inlet valve again closes to repeat the cycle. From this wide temperature and pressure variation inside the combustion chamber it becomes evident that the spark plug is subjected to unbelievable punishment, along with critical expansion of the plug parts.

SUBJECTED TO ABRUPT TEMPERATURE CHANGES

The expansion of the spark plug parts, due to heating, not only impairs the gas tightness of the plug, but also places heavy demands on the plug insulator. Thus, at red heat, the tip of the insulator has to stand up to abrupt gas temperature changes between 140 and 5400 deg. F., in the combustion chamber; while at the same time, its upper part is exposed to the flow of cooling air. Such temperature variations requiring a high degree of heat resistance, apply not only between the insulator tip and upper parts of the insulator, but also between its exterior and interior.

As shown in one illustration, the heat conductivity of the spark plug insulator is important. Mechanical resistance of the insulator is related to its thermal strength, since only a mechanically resistant material is capable of coping with the tensile and compression stresses to which it is subjected by the sudden changes in heating and cooling.

High mechanical resistance is necessary for the ceramic insulator because it is either firmly screwed into the steel shell or the latter is crimped around it to render it gas-tight, and the pressure applied in crimping may well exceed several thousand pounds.

Obviously, the parts of the plug which project into the combustion chamber are exposed to chemical action by compounds and gases formed in the process of ignition and combustion. Thus, the insulator, electrodes and other parts must be highly resistant to such action. There is not much the technician and mechanic can do about this, but naturally the spark plug manufacturers have considered it, and are constantly developing new processes to combat such action and prolong spark plug life.

As to the electrical requirements with which the spark plugs must comply, one spark plug manufacturer points out an example of a single cylinder, two-cycle engine operating at a speed of 4200 rpm. Under these conditions, the plug has to provide 70 sparks per second, or more than 250,000 sparks in one hour, for each of which 1/1000 to 1/2000 second is available, since they have to jump

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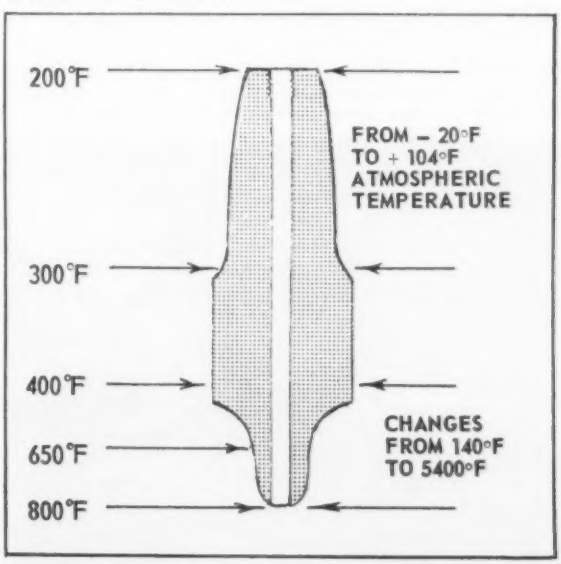
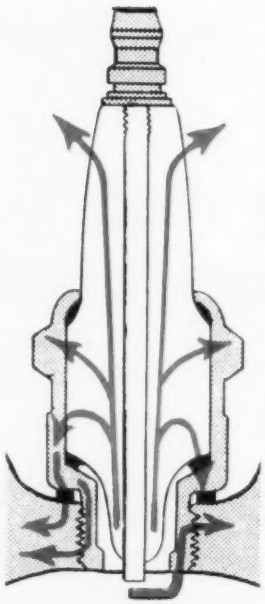
Differences in temperature to which a spark plug insulator is subjected during engine operation.



Power Starts With A Spark

. . . CONTINUED

over at an accurately specified piston position. This is extremely demanding on the insulator, which has to provide adequate safety against electrical puncture and flashover even at the high sparking voltage of 10,000 to 25,000 volts needed with modern engines, and above all, at the high temperatures occurring on the insulator. It must be remembered that there is not much wall thickness on the insulator of a 10mm. spark plug, for example, from the plug center to the shell within the relatively small thread diameter.



Heat conducting paths of a spark plug. Arrows show that the main paths lead along the insulator.

The complete ignition system has a much harder job to do in high compression engines than it did just a few years ago when compression ratios were 6 to 1. And the spark plugs take the most severe punishment. For every single increase of one number in the compression ratio, the temperature of combustion in the engine cylinder goes up 100° F. This means that in stepping up the CR from 6 to 1, to 10.5 to 1, the cylinder temperature goes up 450° F., obviously quite an increase.

SELECTED ONLY AFTER THOROUGH TESTING

When a new engine is released for public consumption in cars, the recommended spark plug is specified by the manufacturer. The selected plug is the one that has been found to be the most suitable after exhaustive tests. Therefore, the specified type of plug should be used for all average driving.

However, we all know that the type of driving may make it advisable in some cases to modify the plug specification somewhat. For example, a salesman who drives long distances in open country at high speed, often with a heavy load, may use a plug with a heat range that is one number colder. On the other hand, a motorist who generally makes short trips with frequent stops and many cold starts, may require a plug one number hotter to burn off the combustion deposits.

The heat range is determined by the length of heat path from the tip of the ceramic insulator to the sealing gasket at the shoulder of the insulator, at which point the heat travels through the metal of the plug body to the water cooled metal of the head or cylinder block.

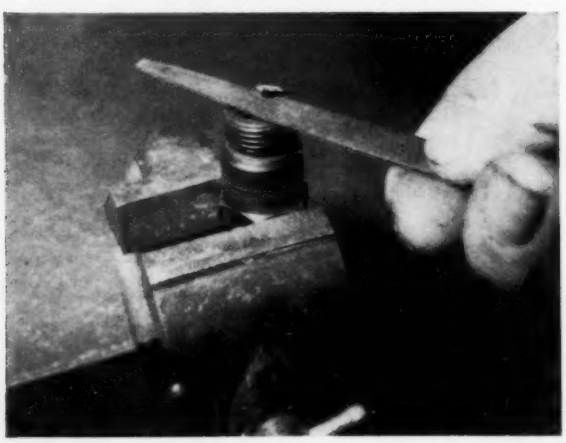
WHY HEAT RANGE IS SO IMPORTANT

Having the correct heat range is important both from the standpoint of service life and engine performance. A plug that is too hot will get overheated at the tip and can cause preignition, which can be very destructive to pistons, rings, and bearings. On the other hand, a plug that is too cold will collect carbon or other deposits on its insulator. Carbon deposits are directly conductive and are liable to short out plugs. Certain other deposits resulting from combustion processes are not conductive when the plug is relatively cool. However, when the plug is heated to a higher than average temperature from high speed driving, pulling a heavy load, climbing up long hills, or very fast acceleration, such deposits become conductive and the plugs will short out, causing misfiring.

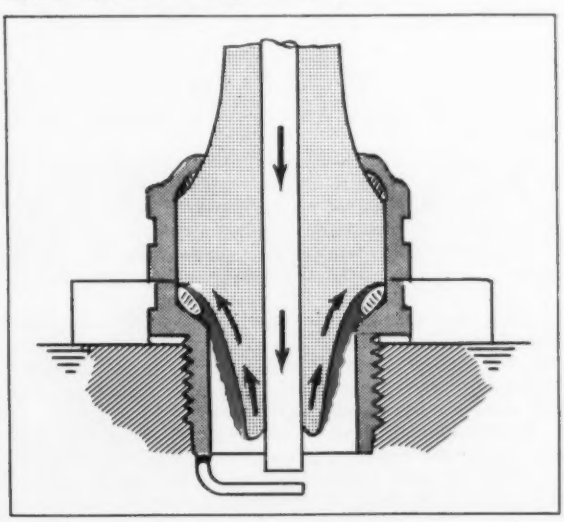
It must be appreciated that as the compression pressure increases in the engine cylinder, higher secondary voltage is required to pass a spark between the spark plug electrodes. Also, the coil will supply just the voltage required for the spark plug gap under the existing conditions in the cylinder, up to the limit of the total available voltage of the given high tension circuit. For example, if the compression pressure in an engine requires, say, 20,000 volts for the electrical energy to pass through the plug gap and initiate the spark, the coil will supply 20,000 volts. Should plug condition and compression characteristics be such that 23,000 volts are required, and available voltage is only 22,000 volts, the plug will misfire.

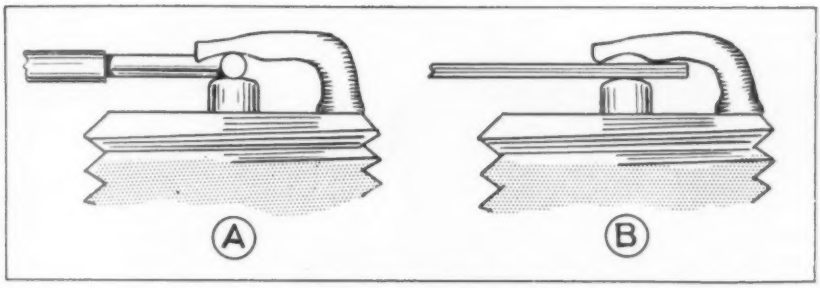
There are four factors which affect the firing of a spark plug. These are (1) condition of the plug, (2) condition and capacity of the secondary ignition circuit, (3) con-

Ground electrode bent outward to permit filing the worn and rounded end of the center electrode flat and square. After filing, the ground electrode is reformed and the gap correctly set.

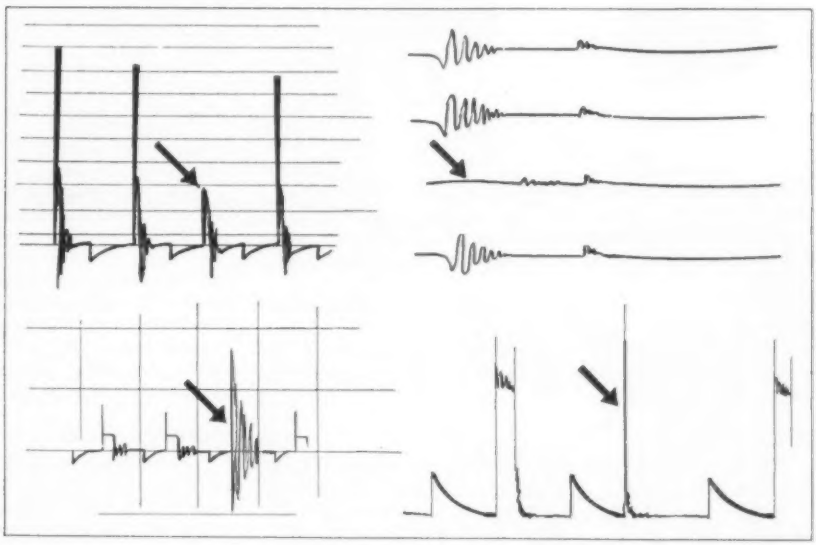


Compounds formed by burning fuel, oil and their additives, when deposited on the spark plug insulator, provide an alternate conductive path for the high tension current. If resistance of the deposit is low enough, loss of electrical energy through the deposits may keep the plug from firing.





A wire type gauge (A), eliminates possibility of incorrect electrode gap setting which can occur with a flat feeler (B) on irregularly worn electrodes.



Examination of the trace on 'scope screens quickly pin points spark plug malfunctioning or troubles in other components of the ignition system.

dition and voltage in the primary circuit, and (4) the existing compression in the cylinder.

The condition of the plug depends on three factors, (1) the size of the gap, (2) the condition of the plug electrodes, particularly the center insulated electrode, and (3) the condition of the ceramic insulator. The size of the gap should be as specified, and will generally be set at .030" to .035". It was found some years ago that idling is improved with the gap set at .030" or a little more.

The condition of the electrodes is important. As the spark plugs are used, electrical erosion gradually rounds over the end of the center electrode. It is more difficult for the spark to "jump" the gap between the ground electrode and a rounded center electrode end, than to a center electrode which has a flat edge at the end. The difference may amount to as much as 30% more than the voltage needed for a new or properly conditioned plug.

The ceramic insulator must be clean and free from deposits of carbon, or other foreign matter, resulting from the combustion of the air-fuel charge. To appreciate the significance of these deposits, let's recall that there is electrical pressure, in the form of high voltage trying to pass through the spark gap from one electrode to the other. Electricity always seeks the path of least resistance. Therefore, if deposits which are conductive either at low or high temperatures are present, there will be electrical leakage. This will decrease the sparking voltage, causing either a weak spark or complete misfiring.

Ceramic insulators that become overheated have a blistered, ashy appearance. Those plugs with the correct heat range will have a clean light tan color, while insulators in plugs that are too cold usually have a black coating, which may be either hard or soft.

Some time ago, several spark plug makers, Champion, Auto-Lite, and AC, for example, introduced plugs designed to operate under the severe conditions resulting from the high compression ratios and combustion chamber temperatures in late model engines.

Champion and Auto-Lite plugs are made with the ground electrode projecting nearly ¼" beyond the end of the plug body. The ceramic insulator projects about ⅛". The center electrode is heavier than formerly and projects beyond the tip of the insulator over 1/16".

The purpose of this design is to allow the projecting ground electrode and insulator tip to get hot enough at low speed driving to burn off any deposits that might form. At high speed driving or heavy pulling, with the throttle opened wider, the volume of relatively cool gases blowing over the extended plug parts cool them and prevent them from reaching excessive temperatures.

AC uses a different approach. On the AC plug the ground electrode follows the conventional design except that the flat wire is heavier than formerly. The ceramic insulator instead of fitting tightly around the center electrode has an annular recess ⅛" to 3/16" deep at the tip so that it will get hot enough to burn off low speed deposits. At high speed, there is enough heat conducted away from the tip to prevent preignition.

The German-made Robert Bosch spark plugs, famous for many years in Europe's racing cars, especially, are again available in the U.S. Manufactured since 1902 the complete line of Bosch plugs is said to have the widest productive heat range for all types of motor vehicles.

Designed for modern higher compression engines, Bosch plugs of recent manufacture are constructed with a Pyranit insulator of thin walls, but puncture-proof at the highest temperatures encountered in operation. The

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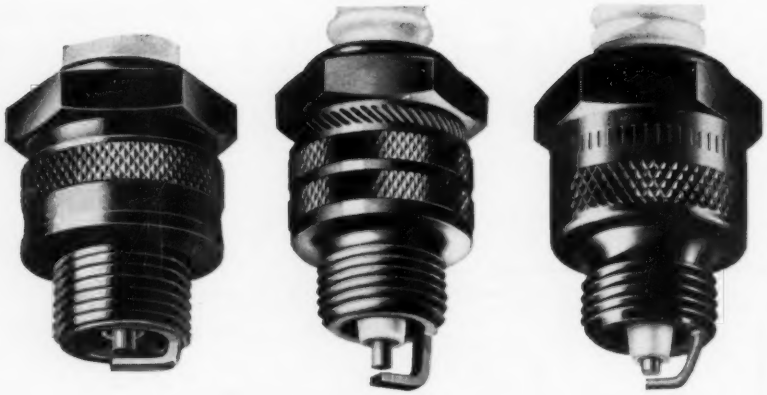


Left to right: AC, Auto-Lite and Champion spark plugs. The insulator of the AC plug is counterbored so center electrode does not touch it at the tip. The Auto-Lite insulator, center electrode and ground electrode are well extended. A long insulator tip, heavy center electrode and long ground electrode are features of the Champion plug.

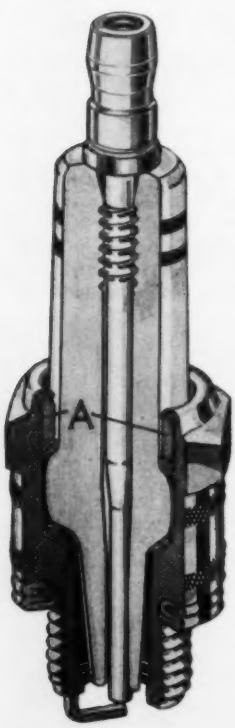
Power Starts With A Spark . . . CONTINUED

Bosch company states that the insulator adjusts itself immediately to operating temperatures thereby preventing fouling and pre-ignition of the incoming air-fuel charge.

The new type P11S Bosch plug with a noble-metal electrode (nickel, manganese and silicon alloy) covers the thermal value of three normal plugs, according to the maker. A wide heat range, 45-440 degrees F., is available in the Bosch line.

INSTALLING PLUGS

Spark plugs will fail when incorrectly installed. Correct installation is simple. Plugs should always be torqued into place, using 25 to 28 lb. ft. for 14mm and 12 to 15 lb. ft. for 18mm plugs without gaskets as on Ford-built engines.



Section of the new Robert Bosch spark plug (left). Compensating ring (A), is interposed between the insulator and plug shell, the latter being crimped at high pressure to secure the parts.

Be sure to use a deep socket, preferably one of those with a rubber insert to hold the contact end of the plug in line. This will minimize breakage of plug insulators. On some of the late engines the recess around the plug is not large enough to permit the use of a ½" drive socket, and a ⅜" drive socket must be used. When plugs are in fairly tight and it is difficult to apply enough torque to loosen them with a ⅜" driver, use a ⅜" to ½" adapter so a longer ½" nut spinner can be used to loosen the plugs, after which the ⅜" ratchet can be used.

SERVICING PLUGS

In addition to cleaning (which should be done thoroughly), the ground electrode should be bent far enough out of the way to permit filing the end of the center electrode, square with its center line, sufficiently to remove all the rounded portion, leaving a sharp edge. Such treatment given to plugs that have been firing will put them in condition to give further satisfactory service. The side electrode should be bent back into its original position and the gap adjusted and checked with a round, not flat, gauge. The cleaning should be thorough enough to remove all deposited material on the insulator; and the plugs should be blown out to remove all cleaning material. The air jet should also be applied to the plug threads to remove any foreign matter they may pick up from the cleaning operation.

In many shops plugs are not examined, but removed

(Continued on page 72)

The new Robert Bosch spark plug (right) built with thin wall insulator said to be puncture proof at highest temperatures. Electrodes are nickel, manganese and silicon alloy. Maker states that the plug covers the thermal value of three normal plugs.

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AUTOMOTIVE BUSINESS KNOW-HOW

"So you want to open a service shop?"

It's like leaving home to "go on your own" the first time. Here's "boot training" for the ex-salaried-employe embarking on the tossing seas of independent enterprise.

By HERB CARRIER, Detroit Editor
and
DR. GEORGE W. FIELD, Wayne State University

● SOONER OR LATER every skilled mechanic has the urge to "go into business". This is good. It's this spirit and love of free enterprise which makes our country the most highly productive nation in the world. Then, too, few jobs can match the satisfaction, challenge, and excitement of owning and operating one's own business.

VAST SERVICE MARKET

Skilled automobile mechanics have an unusually fertile area in which to become established as independent businessmen. At this moment, there are an estimated 67 million cars and trucks in daily use throughout the country. Experts say that by 1975 there will be a minimum of 100 million vehicles in use.

Every one of these will require the services of skilled mechanics from time to time.

The automotive repair field is immense. *Billions* of dollars are spent each year in this aftermarket. 1958, for example, will see the expenditure of over 8 *billion* dollars for replacement parts alone, and this figure does not include tires, anti-freeze, or customer-paid labor. The labor figure should equal, or surpass, the cost of parts.

On the job today are approximately 775,000 mechanics. This figures out to be about one mechanic for every 87 vehicles. Picture one mechanic maintaining a fleet of 87 vehicles, and you'll readily see why it's generally agreed that there is a definite shortage of skilled mechanics.

The tremendous number of vehicles, plus the shortage of service personnel, appears to point to a service garage as one of the most lucrative and fool-proof of all small businesses.

NOT ALL ROSY

However, as in all things, there is another side to the story. The step from working as a mechanic for an established garage, to operating your own business is a mighty big jump. It can be compared rather closely to leaving home. A youngster living with his parents is well provided for. He cares little about who sets the alarm clock, pays the rent, buys the food, or absorbs the cost

Skilled mechanics have an exceptional opportunity to become independent businessmen—but when they do, they forfeit the luxury of a boss to absorb most "headaches."

Proprietorship brings penalties as well as rewards. Be prepared for duties that don't end when the front door is locked.

of dozens of maintenance items such as doctor bills, insurance premiums, and clothing, heating, and entertainment expenses.

Not until he leaves home and "gets out on his own" does he fully appreciate the responsibility and expense of maintaining a household.

This, basically, is the same kind of feeling experienced by many mechanics who open their own service shops.

While working as mechanics for an established business, they were only concerned with two things—doing a good mechanical job, and getting a regular paycheck. Let the boss worry about overhead, taxes, insurance, building maintenance, equipment, licenses, and all the many, many things that add to the headaches of running a business. That's what bosses are for.

The very day the mechanic leaves this situation to open his own shop, he forfeits the luxury of having a boss to run the business.

No longer can he be concerned with just doing a good mechanical job. Immediately, all his mechanical ability must be supplemented with an equal amount of managerial efficiency—and that's not easy. Nor, fortunately, is it impossible, else there would not be thousands of successful independent service shops.

A qualified mechanic who contemplates going into business for himself must do a careful job of analyzing the situation. First, he must analyze himself. Is he the kind of man who would do well in business? Naturally, there is no set "business-type". However, virtually every successful businessman has the same general qualities.

CRITICAL ANALYSIS

Ability to deal with people—Perhaps the number one ingredient of a good businessman is the ability to deal with people. This is a *must*. To a salaried mechanic, dealing with people might only mean getting along with the boss, and occasionally saying something nice to a customer. It's possible for some mechanics in large service garages to go for days, or even weeks without coming face to face with a real live customer.

In starting your own business, however, you might find yourself acting as a combination owner-operator-mechanic-car jockey. In this case, it will be up to you personally to greet potential customers, quickly gain their confidence, sell the job, deliver the car, and collect.

All these steps require constant close contact with the public. Can you handle these "selling" situations with the same skill with which you do the actual repair work? Are you willing to take a lot of abuse at the hands of irate, and sometimes unreasonable customers? Can you "smile through" their constant harangues about high prices, discounts, and poor service?

If the answers to these questions are "yes", then you have one of the biggest problems whipped. If the answers are "no" or "maybe", you'd stand a good chance of being unhappy in your own service business.

Capacity of Decision—Some men are excellent followers, but poor leaders. The follower works best when given instructions. When faced with making decisions, many followers are lost. "Tell me what to do, and I'll do it", is the follower's slogan.

This is a fine attitude for a mechanic, but it spells disaster for an independent businessman. Everyday decisions *must* be made. What should I do about advertising? Should I take on another line of goods? What equipment should I buy? Can I afford to give credit? How about expansion? How much inventory? These and dozens of other problems, require quick intelligent answers.

Chances are you could make proper decisions if you

(Continued on following page)

When a skilled mechanic starts his own shop, he could be opening the door to satisfying business and financial independence, or letting himself in for a costly, discouraging experience. Usually, the final result—success or failure—hinges on *Management*.

As a special service to our readers, AUTOMOTIVE SERVICE DIGEST calls on Dr. George Field to work with our Detroit Editor in presenting a comprehensive series of "business know-how" articles. These will describe, in clear, down-to-earth language, the kind of *business thinking* a mechanic must apply to make a go of an independent repair shop.

HERB CARRIER

DR. G. A. FIELD

George A. Field, Ph.D., Associate Professor in the Department of Marketing, School of Business Administration of Wayne State University, is exceptionally well equipped to offer instruction in business management. His extensive background includes experience as a Chevrolet District Manager, Ford Sales Training Specialist, and Sales Training Consultant. He has also conducted lecture courses in introductory business, sales management, marketing principles and allied subjects at the University of Pennsylvania and Penn State University.

This new ASD feature series has been especially planned and prepared to cover both the fundamentals of starting an automotive service business, and the tried and proved management techniques used currently by successful firms. Whether you are still in the dreaming stage or already running your own shop, you will find these articles of great personal value.

Though you may feel like throwing him out on his ear, the customer is always right. And the boss can't pass the buck; he's responsible for everything that goes on in his own place of business.

had spent as much time in the management end of the business as you have in the mechanical end. This is not likely. So you're going to have to learn the answers some other way. Fortunately, there are other ways. Much "management" information can be obtained through such sources as Automotive Maintenance Associations, U.S. Library of Congress, Parts Manufacturers, Equipment Manufacturers, Jobbers, etc. All these groups are willing and anxious to help independent shopmen solve their management problems.

SELF-ANALYSIS TEST

One of the very best ways to see if you have the personality and temperament to own and operate your own service shop, is to ask yourself the following questions. They don't tell the whole story, but they do highlight the areas which might prove the most difficult when you make the big step from mechanic to owner. (Write your own "yes" or "no" to each question before reading the answers that follow.)

Yes	No	
☐	☐	1. Are you a self-starter?
☐	☐	2. Are you easily annoyed by "unreasonable" customers?
☐	☐	3. Do you work better when there is someone above you to take the brunt of the "selling" responsibility?
☐	☐	4. Do you suffer from a chronic mechanic's disease—job hopping when the going gets rough?
☐	☐	5. Do you insist on "starting at eight, and quitting at five"?
☐	☐	6. Can you work with a long range plan, or must you have immediate success?
☐	☐	7. Can you readily accept responsibility for the mistakes of others?
☐	☐	8. Are you considering entering business because of its challenge, freedom, and growth possibilites?
☐	☐	9. Do you look upon your own business as a chance to "get rich quick"?
☐	☐	10. Do you do a good job of planning and meeting personal expenses from payday to payday?

ANSWERS

1. Yes. This is most important. You must be able to drive yourself past the ordinary demands of a salaried employee.

2. No. In your own business, "the customer is always right." You may feel like throwing him out on his ear, but it just can't be done. If this kind of customer gets under your skin, you'd better take a second look at the idea of starting your own shop.

3. No. Personal service is one of the biggest items an independent operator has to sell. Customers like to feel that they are dealing with the head man. You must accept the feeling of being on a direct man-to-man basis with all your customers. If you can't take the "selling" responsibility, you're liable to hire a manager to do it for you. Then you'll wind up in the same situation that you thought you left, except that you'll have a lot more headaches.

4. No. This is strictly an employee's privilege. There's more to quitting business than just packing up your tools.

5. No. Be prepared to devote a considerably larger share of your time to your own business. Even long after you lock the door in the evening, you'll be mentally running the business.

6. Yes. It takes a while to build up a business. It's not unusual to spend many months building, planning, and organizing before you can show tangible results.

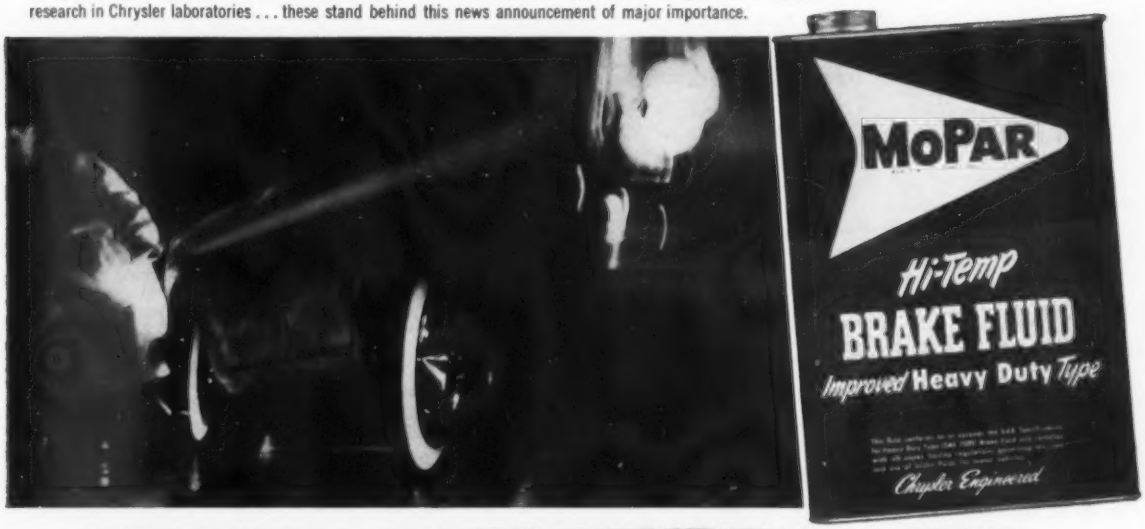
7. Yes. The boss can never pass the buck. He's directly responsible for all that goes on in his place of business.

8. Yes. Your own business can be a genuinely exciting experience. It's a great opportunity for you to prove to yourself that you have what it takes.

9. No. There's money in it, true. But you have to build the reputation for honesty and reliability before you are in business to stay.

10. Yes. This is a good yardstick. If you have done a fair job of handling your personal finances, you'll quite likely do as well handling company funds. But you'll need a lot of actual "business know-how" to guide you in the efficient use of comparatively large sums which belong only in part to you. Remember, you'll have plenty of creditors whose cooperation is vital to success.

Five years of grueling road tests, over mountain roads, in desert heat and in city traffic . . . five years of continuous research in Chrysler laboratories . . . these stand behind this news announcement of major importance.



EXTRA SAFETY

announcing: nearly 100° of extra protection with new MoPar "Hi-Temp" Brake Fluid

Today's new MoPar "Hi-Temp" Heavy-Duty Brake Fluid stands up to heat nearly 100° higher than present specifications established by the Society of Automotive Engineers.

Your customers will appreciate knowing about this major "difference in degree," since the friction heat of braking can raise brake fluid to the boiling point—and bubbles in the lines can cause brake fading and failure.

Order this entirely new kind of brake fluid from your MoPar wholesaler salesman or your Plymouth, Dodge, De Soto, Chrysler or Imperial dealer now.

BRAKE BUSINESS IS PROFITABLE BUSINESS!
Don't forget that a lot of your customers are ready for MoPar Cyclebond Brake Linings, MoPar Brake Hose, Cyclebond Exchange Brake Shoe and Lining Sets. All are products your customers trust. All are *official, authentic* Chrysler Corporation products.

MoPar
PARTS & ACCESSORIES

MoPar Division, Chrysler Motors Corporation
Detroit 31, Michigan

Treat the customer right, and he's a valuable friend, a business asset and an important advertisement of your shop's service. There's science, good sense and profit in the proper methods of . . .

By FRANK WEST

Handling customer complaints

• ANY SERVICE SHOP—dealer or independent—will have customer complaints from time to time. The way these complaints are handled will many times mean the difference between making a steady customer for the shop, or losing one—who may also cause others to stay away. Therefore, it is important that some thought be given to the competent and satisfactory handling of customer complaints, as a very important part of the successful service sales in any shop that wants to stay in business and continue to make a fair profit. If an organized procedure and policy have not been previously worked out, they should be. It might pay, too, to review the way past complaints have been handled, to see if this cannot be improved.

Let the complaining customer blow off steam—and make it easy for him to find someone to listen. But never lose your own self control. Patience and courtesy win more points than argument, as a rule. (Photos courtesy Art Hansen Buick, Chicago)

AFFECTS CUSTOMERS DIFFERENTLY

When business transactions do not turn out satisfactorily to the customer, relations which were previously friendly can quickly become just the opposite . . . if the customer feels that he has been unjustly treated or has a reasonable, unsatisfied complaint.

Dissatisfaction with purchases of equipment or service affect different people in different ways. Some people say nothing, they just stay away from where they feel they got a bad deal, poor or unsatisfactory treatment. Frequently they influence their friends to stay away also. This "absent treatment" is difficult to combat, because in most cases the shop will not know it is being used.

A good follow-up system of checking customers who have not been in for some time, will often bring to light some of those who are dissatisfied. Good salesmanship and knowledge of how to handle people, usually brings such customers back into the fold.

Customer complaints can be divided into three general classes: (1) justifiable complaints, which the shop must honestly agree are legitimate; (2) complaints which the customer feels are fully justified, but the shop considers are not, and (3) unjustifiable complaints.

BE FAIR ABOUT THE FAULT

Justifiable complaints are usually due to faulty parts, equipment or service work; wrong products, parts or equipment; wrong prices, slow delivery, work not completed, errors

Get all the facts about points in dispute. Complete records of every job should be maintained, and consulted—with the customer—right from the start.

Explain exactly what was done and why—and equally important the things recommended but not ordered.

in billing, or salesman's misrepresentation.

The exact nature of the complaint, when called to the attention of the shopman who handles such matters, will indicate the remedial measures to be taken. A very important point to be remembered is that when you are on the wrong side in the case of a justifiable complaint, admit it without argument. Find out just what the customer expects to have done to correct the situation, then do it. It may cost some money, but correcting errors is one of the usual expenses involved in running a business; and it is a good-will investment that is worth while.

It is a good idea to keep records of adjustments that have been made both in the customer's job record sheet and in a separate office folder. Analyze the causes of the complaints; then take steps to minimize the causes in the future, as much as possible.

USE SALES DIPLOMACY

Complaints on which there is a difference of opinion as to their justification, require more judicial consideration and careful handling. This requires more salesmanship than anything else, because the customer is usually mad. He is mad because he thinks you haven't done what you were supposed to do, or have overcharged him, or there is something else on his mind which is disturbing him.

There are a few simple approaches to the complaining customer. First, don't let him make you lose your own self control. Patience and courtesy have ended many an argument, because it takes two to argue. After letting the motorist "blow off steam" and tell his story, immediately do the thing that really enters into the question: **Get sufficient facts about the subject of the dispute.** It may require that the records of the sale or repair job be brought out. This brings out the value of keeping adequate records, especially on each repair job. It may be necessary to make a careful check-up of the car that was worked on, to find out exactly what was done, and what is the condition of the automobile.

SIMPLE EXPLANATION IS BEST

Only from this as a starting point can a suitable reconciliation or adjustment be made. Once the facts about the job are available, it may be obvious that there is no basis for the complaint, and therefore no basis or justification for additional work or replacement of parts. Remember that only in exceptional cases does your customer know much about automobiles except in a very superficial way. Therefore, you will have to be patient in explaining what was done on a job, and why. Don't over-do the explanation—make it as brief as possible, since it may do more to confuse than to help if too detailed.

Only from the standpoint of the facts in the case, analyzed with the vehicle owner, can the right answer

(Continued on page 32)

Be frank and fair about adjustments, so everyone understands what will be done; who pays the cost.

AC SELLING *SLANTS*

MONEY-MAKING FACTS

SPRING INTO ACTION.

$102,500 Jackpot

AC's BIG "SPRING INTO ACTION" CAMPAIGN WILL RECEIVE POWERFUL NATIONAL ADVERTISING SUPPORT

National Magazines

Striking full color, full page AC Spark Plug and Oil Filter ads will carry the "Spring Into Action" theme to the millions of readers of "Life," "Look," "Saturday Evening Post" and "Reader's Digest."

Billboards

"Spring Into Action with AC Spark Plugs and Oil Filters" . . . on over 5000 billboards, in every marketing area of 25,000 population. Millions of motorists will see these AC Action reminder messages daily.

Television

Bright, attention-attracting "Spring Into Action" AC Product Commercials on ZORRO, AC's network TV show on ABC-TV. Viewers will be urged to "Spring Into Action" and visit their nearby AC Dealers.

Point-of-Sale

Your point-of-sale display includes an action-packed window trim that quickly identifies your outlet as AC Action Headquarters, and reminds your customers to get their cars serviced for the upcoming big driving months.

Call your AC Supplier now–

AC SPARK PLUG ⚛ THE ELECTRONICS DIVISION

OF THE MONTH !

FOR DEALERS

...ENTER AC's BIG

for Your Selling Slants!

1001 AWARDS TO AC DEALERS
in the national "selling slants" competition

Yes, during April and May, the hunt will be on . . . for selling ideas used by *you* in connection with *any* AC Product.

Any service station, repair shop operator or car dealer is eligible. Nothing to buy to enter . . . just submit your special spring service promotional plan which ties in the sale of any AC Product (including Guide Lamp) on an official entry form. Your idea could be worth a $10,000.00 U. S. savings bond!

Call your AC supplier today. He has the details, including your official 1001 Dealer Kit containing the official entry and your big "Spring Into Action" point-of-sale display.

get your Official Contest Kit today!

OF GENERAL MOTORS

Watch Walt Disney Studios' ZORRO every week on ABC-TV

AC SELLING SLANTS
MONEY-MAKING FACTS

During April and May . . .

Spring in

With these THREE Big

SPECIAL OFFER . . . The AC Spark Plug Service Tool Kit Worth $26.56 is yours for only $13.21* in this promotion.

WATCH
WALT DISNEY
STUDIOS' ZORRO
EVERY WEEK
ON ABC-TV

The new AC Spark Plug Tool Kit is your answer to those tough, time-consuming spark plug removal and installation problems.

Here's more good news . . . you can obtain this valuable kit of service tools for less than one half its retail value by purchasing the AC FM-36 Promotion Package along with an order for any 48 AC Spark Plugs.

FM-36 PACKAGE INCLUDES:

- **High Quality AC Spark Plug Tool Kit (Shown at left)**
- *** One 8-Pack of AC Spark Plugs (Type 85TS) worth $8.24 which, when sold, reduces your initial investment of $21.45 for the FM-36 Package to the low net of $13.21.**

- **Special AC Adapter Wrench**
- **3″ Extension**
- **6″ Extension**
- **11/16″ Deep Socket with Rubber Retainer**
- **13/16″ Deep Socket with Rubber Retainer**
- **7/8″ Deep Socket with Rubber Retainer**
- **3/8″ to 1/2″ Adapter**

PLACE YOUR ORDER NOW . . . OFFER IS LIMITED!

AC SPARK PLUG ⚛ THE ELECTRONICS

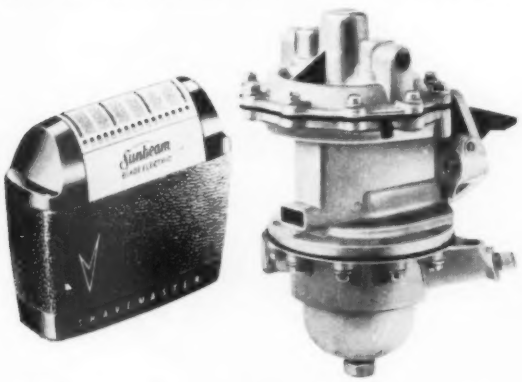
OF THE MONTH !

FOR DEALERS

to Action!

AC Product Promotions!

SPECIAL OFFER . . . New AC Fuel Pump Promotion featuring (Man's) Sunbeam SHAVEMASTER



First time ever offered in a promotion . . . the nationally advertised Sunbeam Blade-Electric SHAVEMASTER that's sold at retail for $29.95. It's yours with the AC Fuel Pump FM-39 Promotion.

Here's what you receive when you order *any* 8 new AC Fuel Pumps and the FM-39 Promotional Package for regular price of the 8 pumps, plus $19.95.

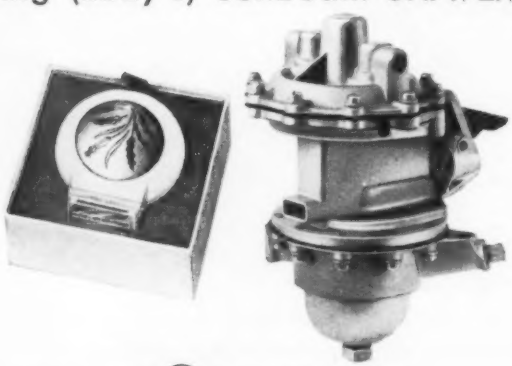
- Sunbeam SHAVEMASTER Nationally Advertised at $29.95
- Popular New AC Fuel Pump (Type 529) worth $15.45
- AC Flexible Line (Type GL-125) worth $1.90

Promotion Details:

Your Initial Cost	$19.95
You recover	
Sale of Pump	$15.45
Sale of Line	$ 1.90
Core Value of Replaced Pump	$ .65
Total Recovery	$18.00

Your net cost ...a low **$1.95**

SPECIAL OFFER . . . Rebuilt AC Fuel Pump Promotion featuring (Lady's) Sunbeam SHAVEMASTER



A beautiful companion gift for your wife . . . the striking Lady Sunbeam SHAVEMASTER nationally advertised at $15.95.

Just order *any* 8 AC Rebuilt Fuel Pumps from your AC Supplier. Ask him to include the FM-40 Promotional Package for an additional cost of $11.95 and here's what you'll receive:

- Lady Sunbeam SHAVEMASTER Nationally Advertised at $15.95
- Rebuilt Popular AC Fuel Pump (Type 2529) worth $9.10
- AC Flexible Line (Type GL-125) worth $1.90

Promotion Details:

Your Initial Cost	$11.95
You recover	
Sale of Pump	$ 9.10
Sale of Line	$ 1.90
Total Recovery	$11.00

Your net cost ...a low **$.95**

CALL YOUR AC SUPPLIER TODAY

DIVISION OF GENERAL MOTORS

AC SELLING SLANTS

MONEY-MAKING FACTS

More news from AC . . . another AC first!

"Spare-Pac" Promotion

for selling more and more

AC

Marine Spark Plugs

Plugs can be separated without disturbing waterproof plastic covering. →

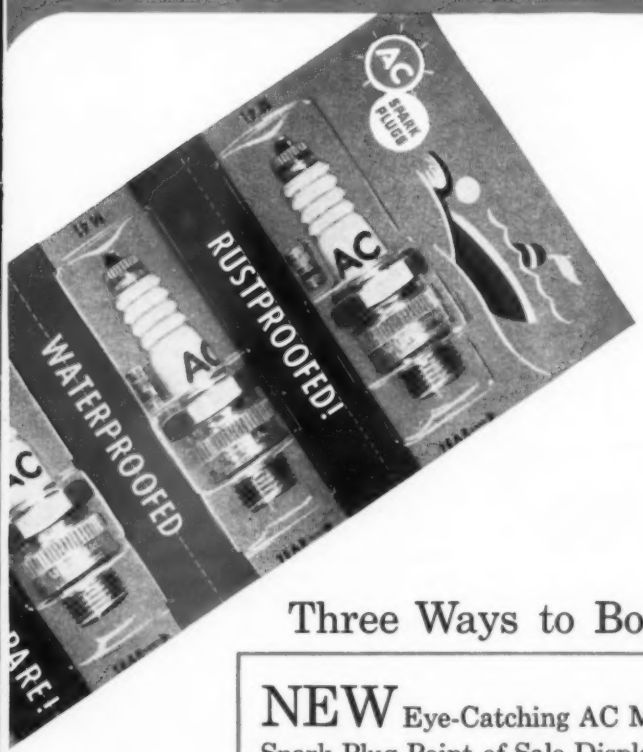
NEW Handy Container for "Spare-Pac" AC Merchandiser

Especially designed so that "Spare-Pac" AC Merchandiser can be folded into it easily and compactly for shipping to you.

GET YOUR SHARE OF THIS FASTEST GROWING SPARK PLUG MARKET . . . DURING THE SEASONAL RUSH

OF THE MONTH !

FOR DEALERS



NEW Plastic Bubble "Spare-Pac" AC Merchandiser

- Each plug sealed separately in water-proofed, transparent plastic enclosure.
- Eight plastic-enclosed plugs mounted on a card hanger that carries a selling message.
- Cards are perforated for convenient tearing-off of individual plugs . . . you can sell one to eight.
- You can hang the "Spare-Pac" Merchandiser in a traffic area . . . where every customer can see it.
- It encourages impulse buying . . . and the carrying of extra spark plugs . . . by all types of boating enthusiasts.
- Customers will quickly realize that plastic enclosures are ideal for tackle box storage.

Three Ways to Boost Your Sales Still Higher

NEW Eye-Catching AC Marine Spark Plug Point-of-Sale Display

Reminds your customers to buy AC Marine Spark Plugs from you . . . whenever they're in your place of business. Place it near the AC "Spare-Pac" Merchandiser to land the greatest number of impulse buyers. The display is available free to all AC Marine Spark Plug dealers.

NEW Colorful AC Marine Spark Plug Decal

Quickly identifies your place of business as headquarters for AC Marine Spark Plugs. It'll help you get your share of this fastest growing spark plug market. Available free to all AC Marine Spark Plug dealers.

NEW Handy Catalog of AC Marine Spark Plugs

Now you have all sizes and types of AC Marine Spark Plugs listed in one handy, easy-to-use catalog. You'll need this information just to handle your marine spark plug business.

- These three AC Sales Promotion pieces are available free to all AC Marine dealers. Ask your AC supplier for details.

AC SPARK PLUG ⚛ THE ELECTRONICS DIVISION OF GENERAL MOTORS

Watch Walt Disney Studios' ZORRO every week—ABC-TV

ORDER A FULL STOCK OF AC MARINE SPARK PLUGS FROM YOUR REGULAR AC SUPPLIER

Complaints ... CONTINUED

be worked out. If you are right, the owner will usually apologize, or at least admit that he is now satisfied. You will have made a friend of the customer, or at least have avoided the loss of a friend and customer.

If examination of the automobile shows that there was some error or omission, it must be decided at once who will take care of or correct the difficulty. This can be either in the form of a policy adjustment, or an order for additional work, for which the owner will pay. Since all businesses require that adjustments be allowed at times, and since no work can be perfect under all circumstances, complaints are bound to come up now and then. But if the adjustment is handled fairly and frankly—and particularly if it is handled promptly and courteously—you can usually retain the customer's good will and keep him coming in for future business.

WANT SERVICE, NOT "RUN-AROUND"

It is extremely important to have one or more persons definitely assigned to handle complaints, unless the shop policy is to have each one handled directly by the man who was on the job in question. This last is not too good, because even an excellent mechanic may be very poor at handling people; and rather than do some work over again may "put off" the customer. The *worst* way to handle complaints is to pass the customer from one person to another, which looks like the "run-around" to the customer and makes him madder than ever.

WEIGH THE CONSEQUENCES

Unjustifiable complaints usually have no legitimate basis. In certain cases, there will be a change of mind and the desire to "get out of" a transaction previously agreed to. In other cases there will be an effort to get concessions, in the way of allowances or free service, to which the customer is not entitled.

At times after a deal is made, the customer will get a proposal that may appear better than the one he bought, and he will try, by complaining, to get the seller to meet the later proposal.

When handling such unjustifiable complaints, the shop operator, manager or foreman should try to reason with the customer, being careful not to show him how wrong he is, but rather to show that the shop's position in the matter is fair and equitable. Where this does not work out, it then becomes a matter of deciding whether the complainant is worth saving as a customer, by giving-in to him, and taking the loss involved; or whether to let him go by turning down his complaint.

Good follow-up will uncover complaints and permit recovery of customers who "haven't been in lately."

This does not necessarily mean the certain loss of a customer. Some customers, even if disgruntled for a while, will come back if they feel they are getting good value for their money, good mechanical service; or it is more convenient to deal with this establishment than some other, which may be farther away, less reliable, or not as well equipped. The reputation of the shop and its standing in the community, are important factors, especially in the smaller towns where the personal element enters strongly into the picture.

Whoever is delegated to handle customer complaints must have the authority to do what seems to be warranted by the circumstances. If it is a matter of defective work, omissions, or incomplete work, the man who did the work should make good on it; but this should be at the direction of the man who handled the customer. A factor in such a case is the question of whether or not a charge was made for work that was not done, or was done unsatisfactorily. If it was not charged for originally, the shop is justified in charging for it when it is done; though as a matter of policy, if the customer is put to some inconvenience in bringing the car into the shop a second time, he should be given some consideration.

ESTABLISH DEFINITE POLICY

Policy governing the handling of customer complaints should be definitely established, and not left as a matter of expediency when these come up. The management of the shop is responsible for the policy, which can have quite an effect on the good will as well as the profit on shop operations. In the first place, the number of complaints should be held down to a reasonable figure; if the same kind of a complaint comes up very often, it should be very carefully analyzed, and the responsibility fixed if possible. Complaints may arise because of acts of omission or commission on the part of individuals: or may be due to management policies; lack of equipment, information or parts; the hiring of incompetent personnel; poor working conditions, final inspection routine or methods of making up customer charges, etc.

When a policy is decided upon, it should be followed through consistently in all cases, so everyone who may be affected will know exactly what to do and what not to do. The customer will quickly sense whether or not he is being handled in a businesslike manner, and will respond accordingly. This will make the successful handling of complaints much

simpler and more satisfactory to all concerned.

SMOOTH THE PATH

A simple rule of procedure that can be applied to so many situations should be kept in mind: If you want someone to do something, make it as easy for him to do it as possible. Thus, when a customer brings in a complaint, make it easy to get someone to listen to him—someone with authority to do something about the complaint. Have the records in such condition that they can be easily referred to if necessary. If a mechanic is to correct defective or incomplete work, make the situation and requirements very clear, so that he will know what is expected.

The business does not exist where complaints are never received, because no one is perfect, and mistakes or omissions will come up now and then in the best run shops. So follow these simple "ground rules":

(1) Decide just who (mechanic, shop foreman, front office) will handle complaints.
(2) Decide how to respond to unreasonable or unfair complaints.
(3) Listen carefully and courteously to the customer.
(4) Decide on the justification of the complaint.
(5) Give the customer time to cool off—and don't get mad yourself.
(6) Take care of legitimate complaints promptly.

Ford Heavy-Duty Trucks Equipped with Alternators

Standard 12-volt, 50-ampere alternators are now included as standard equipment on all Ford heavy-duty trucks, according to a joint announcement made by The Ford Motor Co. and the Leece-Neville Co., manufacturer of the alternator. The announcement points out that this marks the first time that an alternator system has been standard equipment on any mass produced vehicle.

All 1958 Ford trucks in Series C-900, C-1000, C-1100; F-900, F-1000, F-1100; and T-900, T-1000 and T-1100 will be so equipped. Alternators will, of course, be offered as optional equipment on all other Ford truck models.

Air Suspension Tips

Unless the manufacturer specifies otherwise . . . take it for granted that an air-suspended car *should not be under-coated.* Under-coating may prove injurious to the air-suspension bellows.

PROTO'S

GOLDEN KNURL HOLDS EXACT JAW OPENINGS AUTOMATICALLY!

NO BUTTONS . . . NO LEVERS . . . NO GADGETS

Available in FIVE popular sizes

704L	706L	708L	710L	712L
4",	6",	8",	10" & 12"	

Use it like an ordinary "adjustable". Merely turn Golden Knurl, jaws click automatically into desired opening . . . even non-standard and foreign sizes. Jaws won't work loose. Drop-forged, fine Protoloy steel. Thin head for tight places. Highly polished, chrome plated. Job tested and approved by mechanics, coast to coast. Try the Clik-Stop now!

Federal Specifications: GGG-W-631A, Type 1

PROTO TOOLS
PROTO means PROfessional TOols
DIVISION OF TOOL INDUSTRIES

2209 Santa Fe Avenue
Los Angeles 54, California

ANOTHER REASON YOU'LL PREFER PROTO PROFESSIONAL WRENCHES

Servicing the brake system

With the modern trend toward increased engine power, greater over-all weight and smaller wheels (and brakes), the braking system is called upon to withstand greater forces and higher temperatures than ever before.

● THE ENERGY in a 4000 pound automobile going 80 miles per hour can do terrible things if a sudden stop is demanded or if the car collides with some other object, either moving or stationary. Yet when the car is brought to a stop the brakes must absorb this energy.

The energy in a moving vehicle is proportional to the square of its speed, so that the energy in an automobile going 70 mph will be almost twice as much as in one going 50 mph, and the brakes must take care of this energy in bringing the car to a stop. A vehicle speed of 50 mph will result in nearly three times the energy to be absorbed at 30 mph.

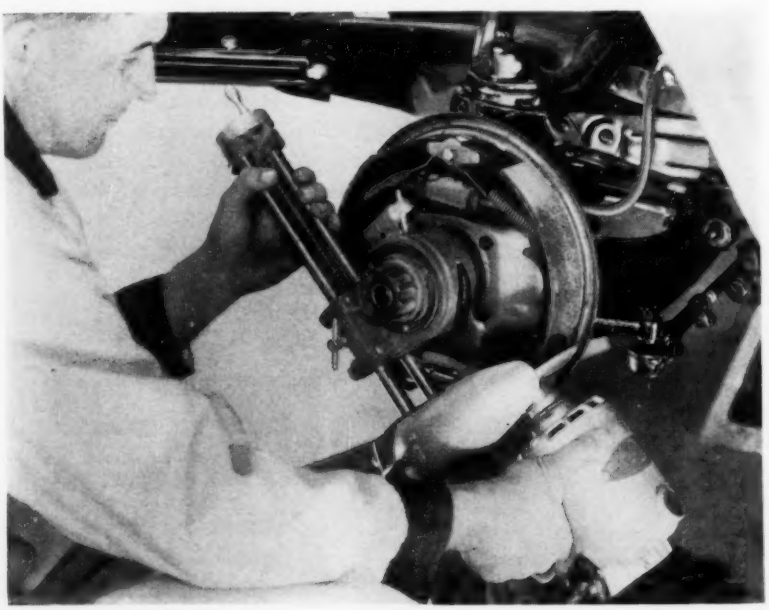
Generally a fast stop is made in less time than it takes to accelerate to a given speed, which means that the brake system has to absorb more horsepower than the engine puts out. This energy is converted to heat, and it is this generated heat which presents the greatest problem in brake design and operation. But the servicing of brakes involves problems of a different nature.

Brake service can be divided into several categories such as (1) drum and brake lining service, (2) hydraulic system service, (3) brake adjustment, and (4) power unit service.

When considering the subject of brakes it is quite important to understand: (1) how the hydraulic brake system functions, (2) the types and designs of the brakes in current use, (3) the mechanical action of the brakes at each wheel, (4) the various adjustments and corrective services required, and (5) the operation of power brake units.

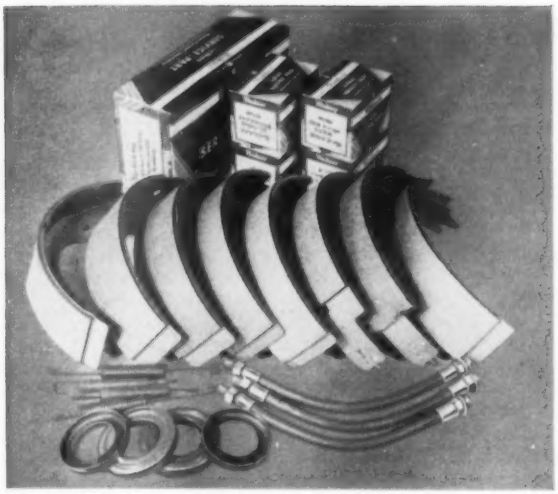
HYDRAULIC BRAKE SYSTEM

The big advantage in the case of hydraulic brakes is that the brake fluid will flow equally in all directions, making equalizing of brakes at all wheels easy. Mechanical advantage is gained by making the master cylinder piston somewhat smaller than the wheel cylinder pistons. For example, a ¾" master cylinder piston will put suffi-



One popular type of brake lining grinder. The motor driven abrasive disk is swung around the shoes to grind the lining to the same curvature as the inside of the drum and also locates the circumference of the lining circle so the position of the shoes, as located vertically by the anchor pin, will match the drum location.

By GUY WETZEL,
Technical Editor



A brake overhaul job requires a lot of parts—shoes, springs, hoses and all the inner cylinder parts. If drums are reconditioned, and adjustments properly made, the brakes will be as good as when new.

cient pressure on the brake fluid to apply almost twice as much force on each wheel cylinder piston with a 1" diameter as is applied to the master cylinder piston.

The hydraulic brake system works in this way:

(1) Depression of the foot pedal causes the piston and rubber cup to move forward in the master cylinder barrel. A very small forward movement of the cup closes the compensating port, and the pressure stroke starts.

(2) Fluid is forced through the outlet valve at the discharge end of the master cylinder into the brake system tubing and to the wheel cylinders, causing the wheel cylinder pistons to move outward against the brake shoes, and forcing the shoes and lining against the drums. The brake fluid, being non-compressible, transmits equal pressure to each of the four wheel brakes, equalizing them.

(3) Removal of pressure from the brake pedal permits the return of the pedal and push rod to their "off" position and the return of the piston and cup. The fluid then returns through the inlet valve at the discharge end of the master cylinder. This releases the hydraulic pressure at the wheel cylinders and allows return of the brake shoes to their relaxed position due to the tension of the brake shoe return springs.

(4) The construction of the compensating type cylinder equipped with a secondary cup allows the presence of brake fluid on both sides of the primary cup, which is designed to avoid air pocketing. The return to the "off" position of the piston and cup is much faster than the return of fluid from the brake system through the outlet, as it is restricted somewhat by the return check valve. As a consequence, a brief vacuum is created in the cylinder barrel and additional fluid is drawn into the master cylinder through holes drilled in the aluminum piston and past the lip of the primary cup as well as through the compensating port. As the fluid finally returns to the master cylinder, excess fluid is bypassed through the compensating port back into the reservoir.

(5) A double check valve is used in all master cylinders of the compensating type, located on the discharge end, and held in place by the piston cup return spring. This valve performs two important functions: (a) it acts as a seal to prevent fluid or air being drawn into the system during the bleeding operation and prevents loss of fluid from the supply tank in case of a break in the tubing; and (b) it maintains a slight pressure (about 7 lbs.) in the brake system, which is not enough to cause the wheels to drag but enough to assure immediate action at the wheel cylinders when the brake pedal is depressed and to prevent the leakage of outside air into the system. In some of the later brake systems a pressure of 10 to 12 lbs. is maintained.

PRESSURE MAY REACH 1,000 P.S.I.

In operation, the master cylinder, with its reservoir, supplies fluid under pressure that may reach as much as 1000 p.s.i. to each wheel cylinder. The stroke of the master cylinder piston must be sufficient to move eight wheel cylinder pistons, and the movement of the wheel cylinder pistons must be limited by correct adjustment of the shoes so that the fluid displaced by the master cylinder piston will be sufficient to move the eight wheel cylinder pistons and force the eight brake shoes against the drum with sufficient force to bring the vehicle to a stop. If the adjustment allows too great a shoe movement there will not be enough fluid to apply the brakes with one push of the brake pedal and the brake pedal must be "pumped" in order to get a brake application. This is a dangerous condition and calls for an immediate brake adjustment.

The system must be tight enough at all points, including the cylinders, to prevent leakage of brake fluid for many thousands of miles of service.

To prevent leakage at the cylinders there are rubber cups, each with its lip pointing inward toward the body of brake fluid in each cylinder. The pressure of the fluid presses the flange of the cup against the cylinder wall so that it seals against leakage of fluid. The fluid acts as a lubricant so that in the absence of corrosion or rust in

(Continued on following page)

A drum lathe designed specifically for turning brake drums quickly and accurately. Mechanic is taking a "reading" with brake drum micrometer.

the cylinder, the cups will last for a long time. An aluminum piston backs up each cup and these metal pistons apply the force of brake application to each brake shoe. In the master cylinder the piston has two cups, the primary and the secondary, and this piston receives the thrust from the push rod which is actuated by the brake pedal.

BRAKE FLUID

The brake fluid used must be prepared in accordance with rigid specifications and only high quality fluid should be used. When brakes are used frequently, especially for stops from high speed, considerable heat is generated, and this affects the temperature of the fluid in the brake wheel cylinders. If it has a low boiling point and starts to vaporize, the result is the same effect as air in the hydraulic system. Since both air and fluid vapor are compressible, there will be spongy brakes and probably little if any braking action.

Two kinds of brake fluid are offered for sale—moderate-duty fluid, and heavy-duty fluid. The Society of Automotive Engineers has announced that only heavy-duty brake fluids are safe in most of the 1955 through 1958 automobiles. In order to assure safe brake action on the highway, do not use anything but heavy-duty brake fluid made by a well known and highly regarded supplier. Even if the high grade fluid costs a little more, charge the customer accordingly but don't jeopardize his life and automobile by using medium-duty fluid.

The specified boiling point of heavy-duty fluid is a minimum of 295°F. This means that only the most suitable ingredients can be used, put together scientifically so that it will not be corrosive, become gummy, attack rubber parts, or form deposits of any kind; must have some degree of water tolerance, and must have good lubricating qualities for the rubber and metal parts with which it comes in contact. Good quality heavy-duty brake fluid will conform to these requirements and enable the brake system to perform satisfactorily, even in severe service, as long as cylinders, rubber parts, linings and drums are in reasonably good condition.

WHEEL CYLINDERS

Cars built since 1934, which are equipped with Lockheed hydraulic brakes, have used "step-bore" wheel cylinders, in which pistons of different diameters are used in each end. This requires right and left hand cylinders which are not interchangeable. Therefore, care must be used in their replacement. On Studebakers, Fords, and other cars using Wagner Lockheed Brakes, the large bore is always assembled toward the front of the car. On Chrysler-built cars using step-bore cylinders, the large bore is always assembled toward the rear of the car.

As the front wheel cylinders are different from the rear wheel cylinders in their cylinder bore sizes, they should never be interchanged, front to rear, as it would cause badly unbalanced brakes. Regardless of the arrangement, the bore with the largest piston will deliver the greatest force to its brake shoe.

It is not advisable to install different wheel cylinders to increase braking effect on heavily loaded trucks or buses, as this will complicate weight distribution and axle strength, and presents other factors which could cause trouble.

BRAKE TYPES IN CURRENT USE

Most of the cars in current use are equipped with either Lockheed or Bendix brakes. Chrysler-built cars generally use the Lockheed, except some models of the Imperial which use disc brakes. Ford, prior to 1949, used Lockheed brakes, but beginning in 1949, Ford adopted Bendix brakes. All the other makes (except Chrysler) use Bendix brakes.

Lockheed brakes use fixed anchors for the shoes, located at the lower end of each shoe, except on the brakes used on front wheels, which use a separate single

Reground brake drum being checked for exact inside diameter with special micrometer (left). Mechanic then grinds the shoe lining on a radius-type brake shoe grinder (below) to .020" under the actual drum size, which gives the correct lining-to-drum clearance.

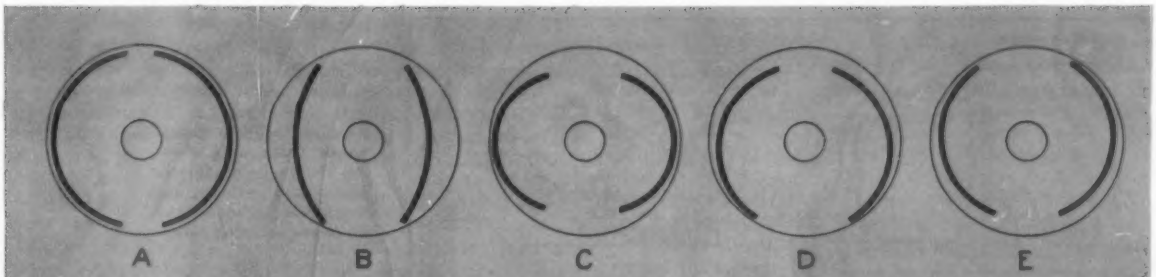


Illustration of brake lining not having the same curvature as the inside of the drum and/or not located correctly. At A the lining fits the drum arc and is concentric. At B the diameter is too large and the lining will only contact the drum at the ends. At C the diameter is too small and the contact will be at the middle of the shoe segment. At D the shoes are not centered correctly and the lining will contact the drum at the lower ends of the lining. At E the shoes are too high.

end cylinder for each shoe diametrically opposite from each other. These brakes have fixed anchors for each shoe with each anchor located next to the cylinder which applies to opposite shoe.

Adjustment is made by spiral cams, one for each shoe, which fix the released position of each shoe. This determines the allowable movement of the shoes, from the "off" to the "applied" positions.

DIFFERENT IN DESIGN

Bendix brakes are quite different in design. They have a single anchor located directly above the wheel cylinder. At the lower ends of the shoes, there is an adjustable spacer which separates the shoes. The lower ends of the shoes are free, or float. When the brake is applied, the shoes are spread apart by the opposing pistons in the wheel cylinder. As the shoes contact the drum, they try to follow the drum as it rotates, until the secondary shoe is stopped by the anchor and then both shoes apply friction to the drum to bring the car to a stop.

This brake is self-energizing, which means that the action of the brake is such that part of the braking action comes from the friction of the primary shoe against the drum. The friction of this shoe makes it try to follow the rotation of the drum and this force pushes against the secondary so that its braking effect is increased.

Some Bendix brakes have an eccentric cam adjustment which locates the primary shoe. Others have the adjustment on the secondary shoe, and some systems do not have an adjusting cam for either shoe.

Prior to 1955 all Bendix brakes used adjustable anchors, which had to be adjusted in most cases when shoes were relined; but in 1955 a number of car makers adopted the fixed anchor. The adoption of the fixed or non-adjustable anchor is a step forward in some ways but also introduces some different problems, which will be discussed later.

ADJUSTMENTS AND CORRECTIONS

Brake drums are subject to wear, heat cracks, elongation, and run-out. Scored drums may be detected visually and are usually the result of road grit entering the brake assembly between the backing plate, or through the adjusting hole in the backing plate. When abrasive material is trapped between the lining and the drum face, rapid lining wear or drum scoring will result. If the score marks are not too deep, the drum can be resurfaced.

Barrel shaped drums have the contact surface of the drum worn more in the center. This condition is usually the result of heat which causes excessive wear or distortion in the center of the drum where the heat is the greatest. Drums in this condition must be resurfaced or replaced to avoid erratic action.

Bell mouthed drums are usually difficult to detect except by taking careful measurements. This condition is caused by distortion of the shoes from excessive pressure. Such drums only provide partial lining-to-drum contact, which results in an unbalanced brake system.

Worn drums (if not worn too badly) may be machined by turning or grinding the contact surface to get it smooth and truly cylindrical, concentric with the center of rotation. Brake drums should never be cut more than .030″ on the radius or a total of .060″ on the diameter, as removing more metal than this will weaken the drums beyond a safe point. If drums have previously been machined and additional machining will enlarge the inner diameter to more than .060″ over the original diameter the drums should be replaced.

SELECT LINING WITH CARE

Brake lining is the friction material that gives brakes their stopping power. It is applied to the brake shoes by either of two methods—riveting, or bonding by means of a special adhesive which will withstand both the temperature and forces involved in the stopping process. The lining must be suitable for the car on which it is used and in accordance with the lining specifications for any given car. On most cars a different lining is used for the primary and secondary shoes. To tell which shoe is which, on Bendix brakes, the first shoe that you come to when moving in the direction of wheel rotation starting at the wheel cylinder, is the primary, and the following shoe is the secondary. On Lockheed one cylinder brakes, the shoes are referred to as "Forward" and "Reverse," with the forward shoe to the front and reverse to the rear. On two cylinder brakes, used on the front wheels of Chrysler built cars, both shoes are forward acting and use the same grade of lining.

When brake drums have been machined and metal removed, either oversize lining must be used to compensate for the increased diameter or shim stock must be used under the lining.

LINING AND DRUM ARC MUST COINCIDE

A fact which is not given as much consideration as it deserves is that the arc of the lining on the brake shoe should be exactly the same as the curvature of the brake drum. If these arcs are not the same, instead of making contact with the drum throughout its full length, the lining will contact either at the middle of the lining seg-

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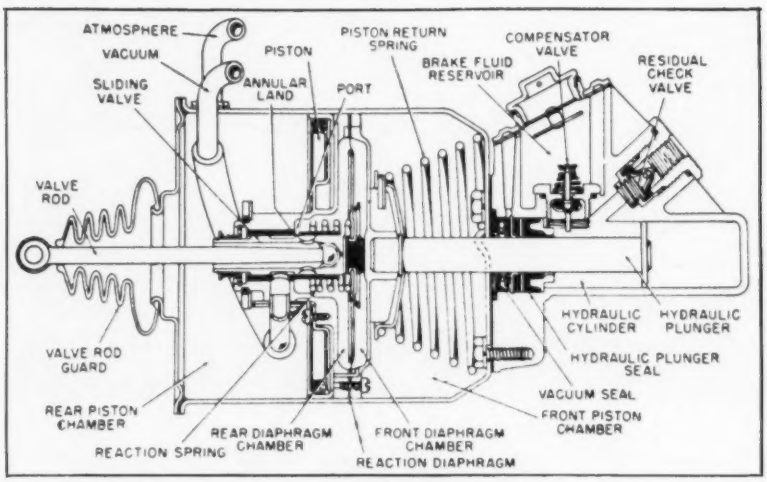


Section through a Bendix power brake unit, showing the vacuum actuated piston and cylinder and the master cylinder with its power actuated piston.

Servicing Brakes . . . CONTINUED

ment if the lining arc has a smaller radius than the drum or at the ends of the lining segment if the lining has a greater radius than the drum.

This correct curvature and centering of shoes can only be obtained through the use of specially designed shoe grinding equipment, available in two popular types—a bench-type grinder, and one that mounts directly on the wheel spindle. Both types are capable of grinding shoes for brakes of the fixed anchor and anchorless type.

ADJUSTMENT OF BENDIX BRAKES

Minor brake adjustment consists of adjusting the shoes only, by means of the star wheel adjustment, and eccentric cams, if any. Major brake adjustment includes adjustment of the anchor if the adjustable anchor is used. Where the anchor is fixed and non-adjustable, the shoes only can be adjusted so there is no major adjustment on these brakes.

On brakes without a cam adjuster, the shoes are adjusted in this way:

1. After all four wheels are jacked up safely, see that the parking brake lever is fully released and is free enough so that the shoes are not moved from their usual "off" position.

2. Check pedal adjustment to make sure that the pedal pad travels approximately ½" before the master cylinder link end play has been taken up and master cylinder piston starts to move. Lubricate pedal linkage.

3. Check anchor pin with a 16" wrench to make sure it is tight (adjustable type). If it is loose it must be reset as instructed for Major Adjustment.

4. Expand brake shoes by turning star-wheel adjuster, moving the handle of the adjusting tool **toward the axle** until a noticeable drag is felt when the drum is turned. Then back off the adjuster 12 to 14 notches so the wheel will turn freely; repeat on the other three wheels.

If the brakes make use of an eccentric cam adjustment on each secondary shoe, turn the eccentric in the direction of forward wheel rotation until .010" clearance is obtained at the center of the secondary shoe. In the absence of checking with a .010" feeler gauge, turn the eccentric until a definite drag is felt when the drum is turned, then back off until the wheel turns freely.

Next, turn the star wheel adjuster until the drum drags when turned, and back off 12 to 14 notches until the wheel turns freely. If there is an eccentric cam adjustment on the primary shoe, follow the same procedure as for adjustment on the secondary shoe. Where the cam adjustment is on the secondary shoe there is an extra spring located in the middle of the shoe which is not needed when the cam adjustment is on the primary shoe.

For the major adjustment with adjustable anchor:

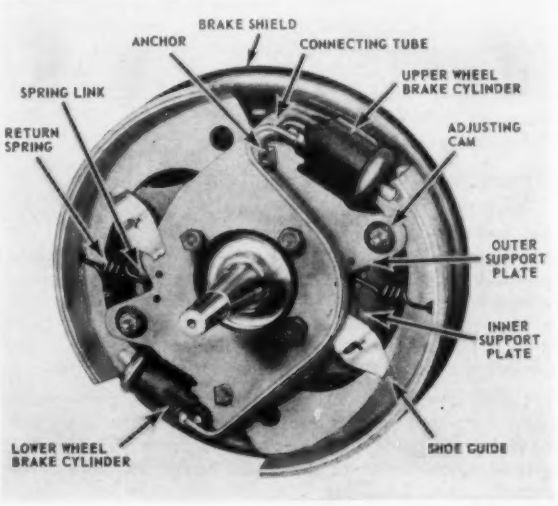
1. Disconnect each parking brake cable at the rear end.

2. Loosen the anchor pin nut just enough so that the pin can shift in the slotted hole in the backing plate.

3. With the brake shoe adjusting tool, turn the star wheel adjuster until a heavy drag is felt when the drum is turned.

4. Tap the anchor pin and backing plate to allow the shoes to center in the drum. If the drag on the drum changes, tighten the star wheel again, and once more tap on backing plate and pin. Repeat until there is no change in the drag on the drum, which means that the pin is now so located that the anchor eye fits as it should at the anchor pin. Tighten the pin nut using 60 to 80 ft. lb. of torque to insure adequate tightness. Back off the star wheel 12 to 14 notches. Reconnect the parking brake cables and adjust them if necessary.

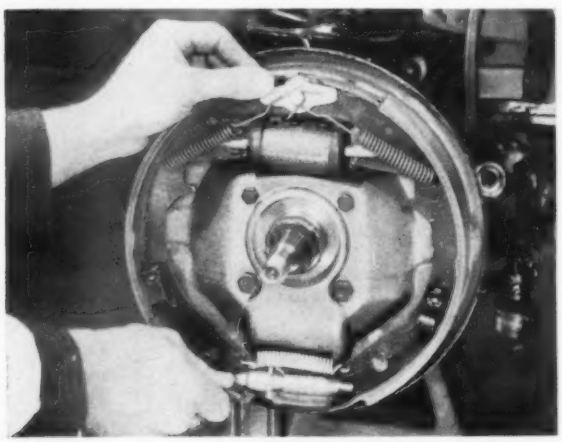
Two cylinder front brake used on Chrysler built cars with a separate cylinder for each of the two shoes. In bleeding these brakes, always bleed the lower cylinder first.



ADJUSTING LOCKHEED BRAKES

On Lockheed brakes the minor adjustment is made by turning a spiral cam at each shoe. Starting with the front shoe, put a wrench on the head which turns the cam, so that the wrench points away from the drum. Pull down on the wrench until a distinct drag is felt when the wheel is turned, then back off until the wheel just turns freely. Repeat on the rear cam, again having the wrench pointing away from the drum, and pull down to tighten, then backing off. The same procedure is followed on front and rear brakes.

The only time that a major adjustment is required is when brakes have been relined or drums turned. The fixed end of each shoe is pivoted on an eccentric washer. Turning the pin on which the washer is mounted will move the end of the shoe. To adjust, turn the spiral cam



On Bendix type brakes the complete brake assembly should be free to move on the raised backing plate pads to obtain good brake action. If shoe rocks on pads, the high pad should be filed down. If the brake assembly won't slide freely, the pads should be cleaned with sand paper and coated with Lubriplate.

as for a minor adjustment until a firm drag is felt. Then turn the eccentric anchor washer and see if there is any increase or decrease in the wheel drag. If the drag increases, reverse anchor eccentric to get the least drag, and tighten the pin. Readjust the spiral shoe-cam as above.

On the Chrysler Center-Plane Brakes, which have floating shoes with no fixed anchor, the two cylinder front wheel brakes are adjusted differently than the Lockheed type. The same type spiral cams are used, but on the front wheel both cams are turned in the direction of forward wheel rotation until each pushes its shoe firmly against the drum and the wheel is locked. Then turn each cam in the opposite direction a little at a time until the wheel turns freely. The rear brakes are adjusted the same as Lockheed rear brakes.

BLEEDING THE HYDRAULIC SYSTEM

Whenever the hydraulic system is opened as it must be when doing any service work on the master cylinder or wheel cylinders, air will get into the system. Whenever this occurs, the air must be purged from the system because air will compress to the limit of master cylinder piston displacement without building up anywhere near the pressure needed to apply the brakes. The result is "no brakes."

The bleeding may be done manually or with a pressure bleeder. To bleed brakes, start with the left front, which is closest to the master cylinder. Remove the small protecting screw from the bleeding valve screw and insert the end of a bleeding tube. Have the other end under the surface of brake fluid in a glass jar, so that air can come out but no air can get into the system. For manual bleeding, the brake pedal is pumped slowly until no more air comes out of the end of the bleeder tube, with the bleeder valve opened. Then with the brake pedal depressed, close the bleeder valve. Next bleed the other front brake, followed by the left rear and then the right rear. If there are two cylinders on the front brakes (as on Chrysler built cars) bleed the lower cylinder first.

Discard the fluid that is discharged from the hydraulic system during the bleeding operation as it will probably be contaminated, and if used will introduce dirt into the system which could cause trouble

POWER BRAKE UNITS

The brake system with power brakes is exactly the same as the conventional brake system with the exception of the source of pressure to actuate the brakes. From the point where the power unit discharges into the brake system, the tubing, the drums, the wheel cylinders, shoes, and other brake parts are no different whether manually or power operated, and any troubles that develop in the system are corrected in the same way.

The power unit is actuated by vacuum from the intake manifold. Three methods of utilizing the vacuum are used: (1) vacuum cylinder and piston, (2) vacuum chamber in which a diaphragm is moved by vacuum and in turn operates a pushrod, and (3) vacuum actuated bellows and push rod. These units add considerably to the power applied to the brake pedal by the operator of the automobile.

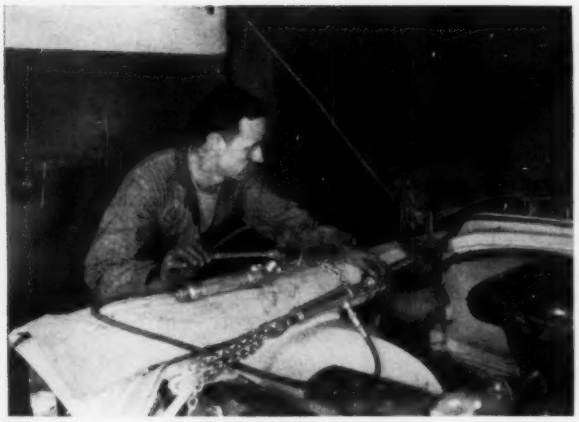
Of the cylinder and piston type there are two designs that are widely used, the Hydrovac and the Treadlvac. The Hydrovac has been used on trucks for some years and recently has been adapted to passenger car use. With this unit the conventional master cylinder operated by the driver supplies brake fluid under pressure to the control valve which opens and admits air to the pressure side of the piston in the vacuum cylinder, and at the same time acts on the piston of the Hydrovac master cylinder. The movement of the piston moves the piston on the Hydrovac master cylinder so that combined pressure of the manually operated master cylinder and the Hydrovac cylinder send fluid to the four brakes. This requires only a light pressure on the brake pedal to get powerful braking action.

On the Treadlvac, the conventional master cylinder is omitted, and the brake pedal is connected to the pushrod. When the pedal is operated, it pushes on the push rod which opens the control valve and allows the air to be drawn out of the vacuum side of the cylinder. This causes the piston to move the master cylinder piston and send brake fluid under pressure to the wheel cylinders to apply the brakes. The manual force applied to the brake pedal is added to the force supplied by the vacuum piston when the brakes are applied.

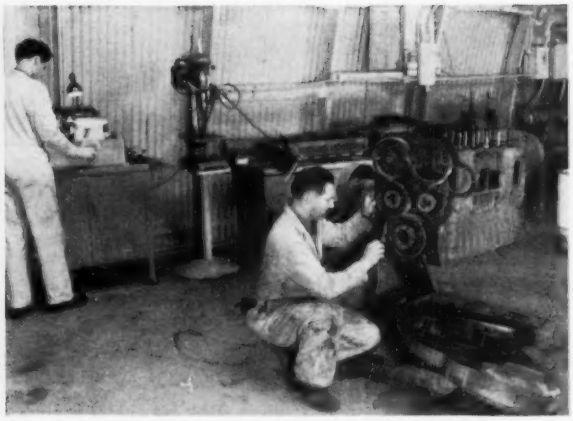
On the vacuum chamber with a diaphragm and on the bellows type of power units, some work with the manual master cylinder as power assists, while others work from a push rod connected to the brake pedal in such a way that when the pedal is pushed, the push rod moves, opening either an air or vacuum valve, and adding its force to the force applied to the push rod by the diaphragm or bellows.

Lack of space prevents going into more detail on the power units. However in a future article we will cover these more thoroughly and also go into trouble shooting.

Say You Saw It In Automotive Service Digest



How much will it cost to fix up John Doe's car—$40 or $240? Only a skilled mechanic can tell.



Who will carry the financial load of this heavy tractor engine overhaul until harvest time?

Selling service on a budget plan

When a customer's car is in need of repairs, but he is strapped for ready cash, don't pass up the opportunity for additional shop profits . . . recommend having the work done now and paying for it through one of the time-payment plans available.

By C. P. EDWARDS

• IN AMERICA, time payments are an accepted way of life. They enable a person to have today what he wants or needs. And unless you, as a shop owner, are making full use of the time payment facilities made available by banks and other financial organizations right in your own community, you are missing a bet that could do much to boost your shop volume and profits.

If you are one who has made it a fetish of paying "cash on the line," more power to you; but remember, the typical customer thinks nothing whatever of buying on time.

COMMON PRACTICE TODAY

Almost any young couple today can get the wedding ring, the house, the house furnishings, and almost everything else incidental to living—all on time payments. And when the pressure gets too great, they can even take a vacation for 10 per cent down and the remainder "from then on."

Some people refer to time payments as "easy payments," and that's where we take exception. Vital as financing may be, it, like every other necessary service, does cost money.

The financing of time payments is a specialty—a specialty every bit as technical as any service job on an automobile. It is unlikely that a banker would attempt to overhaul his own automatic transmission, and the service shop owner who tries to be his own banker is likely to end up about as bad off as a banker who would try to be his own mechanic.

The starting point for helping yourself to better shop profits by helping customers to finance the bigger jobs is a personal call on your banker. Lending laws and procedures vary so widely in detail, however, that only general recommendations can be given here. But always remember—in the eyes of any lending institution, you and your customers are their customers. They want to lend you money. Naturally they're going to charge you for it, and they're going to make a profit on it, which is as it should be. The unfortunate thing is that the charge that they make to you must be high enough to leave a profit even though there are occasional losses. These losses, however, when handled by professionals, are not likely to be frequent or large.

Someone once said, "A banker won't lend you money unless you can prove to him that you don't need it." That isn't quite true. It is true, and properly so, that no lending organization is going to advance money un-

A valve job for cash, or a complete engine overhaul on time payments? Proper financing makes the difference.

less there is good reason to believe that it will be promptly repaid with interest. So no man who is properly in need of financial assistance should be reluctant to talk his problem over with an experienced banker. When the loan is made he will know that on the basis of thorough investigation there is sound reason to believe that he is going to be able to repay that loan.

Let's take the case of John Doe, a successful though not too prosperous salesman. John is a local man, lives conservatively, is industrious, is paying on a new home, but had the mis-

Front wheel balance — or a complete balancing job plus tire purchase . . . credit can make the difference.

fortune of pushing in the front end of his new car.

LOOKS ARE DECEIVING

To John it looked like about a $40 job. While he had public liability and property damage insurance, he carried no collision insurance, so he was pretty badly shaken when he learned that what he thought would cost $40 to repair would actually cost him in the neighborhood of $240. He could see why it would cost this much when the repairman pointed out that not only was the sheet metal sprung, but that the radiator had been badly cut by the fan, and that the fan in turn had cracked the water pump. Then for good measure the front system was badly bent on the right side.

Yes, the shopman's estimate was honestly priced, but where was John going to get that extra $200 to have the job taken care of? He just didn't have $200 laying around for such an emergency.

REFERRED TO BANK

Fortunately the service man handling the job was well acquainted over at his bank, and, appreciating the situation, gave John the name of the vice president in charge of installment loans and suggested John pay him a visit to see about financing the needed repairs. Needing the car for his work as soon as possible, but not having the needed cash on hand to have it repaired, Mr. Doe had little choice, so he went over to the bank to present his case.

In a situation of this kind the problem was simple. Handed a more or less standardized form drawn up especially for this kind of business, John entered the amount of the loan that he needed. The next information that he had to supply was the number of months for which this money would be required. Since he was able to put aside about $40 a month for emergencies, he figured that if all went well he could repay the $200 loan in five months; but to play safe, he requested the money for six months. Immediately below this information he signed the application.

GOOD JOB RECORD HELPFUL

As we said before, the man who gets a loan—even a small one—gets also the assurance that he is going to make good on the repayment. For example, the bank will contact the credit bureau and add remarks of the bureau to this application. They will further check with Mr. Doe's employer, and make note of the person to whom they spoke, the informant's position, and in the conversation verify the date of employment of Mr. Doe, his exact occupation together with his salary or average commission. In addition it will be determined whether Mr. Doe's job is strictly commission, and whether it is permanent or temporary. In the event that it is temporary, its probable duration will be recorded.

And since many people today have records with finance companies for one reason or another, space for the reports of three finance companies is usually provided for on the back of the loan application form.

PREVIOUS LOANS CHECKED INTO

In the event that Mr. Doe has been a client of a finance company, full details of his transactions with the finance company will become a part of the bank's report. The information includes the name of the finance company, the date that Mr. Doe opened his account with this company, together with the total note, the dates payable, and the size of the installments. There will also be a record of the remaining balance if any, and many other details.

With this information on hand, and provided it is reasonably favorable, it is quite likely that Mr. Doe will get

(Continued on following page)

SPECIAL DEAL

MAC'S

THIS $9.00 DISPENSER

Plus 3 FIVE-POUND CANS MAC'S WATERLESS HAND CLEANER

ONLY $9.84

Cut your hand cleaner bill 60%! This beautiful copper-finish aluminum dispenser measures exact amount of Mac's Waterless Hand Cleaner needed . . . usually one shot. (Two are plenty for the grimiest hands!) Dispenser is quickly loaded, self-priming, sturdy, dependable, holds over 3 lbs. And you'll like Mac's Waterless Hand Cleaner. Contains special solvents that clean gently but thoroughly . . . plus soothing lanolin.

Rush order today, offer is limited!

MAC'S SUPER GLOSS COMPANY, INC.
Los Angeles 42, Calif.
Cincinnati 26, Ohio

MADE BY THE MAKERS OF MAC'S IT

DON'T WAX IT, MAC'S IT!

Budget Plan . . . CONTINUED

the money necessary to repair his car. Granting of this loan is due in part to the fact that Mr. Doe needs this car in his sales work.

There is, of course, the possibility that some people would be unable to get a loan in this way. They might, however, by pledging suitable security, obtain the money from one of the constantly advertising loan organizations heard so frequently asking that question, "Could you use $25 to $500 on your signature only?"

CHARGES FOR LOANS VARY WIDELY

There's just one thing to remember in making any kind of purchase—and in borrowing money you are purchasing the use of the other man's money—and that is to find out what you get for your purchase, and what you pay for it. Get it in black and white, and be sure that you know the entire cost, because charges vary widely.

The laws in our 48 states are not uniform. And never overlook the fact that when a loan is repaid by the borrower in a given number of equal payments that the borrower does not have the use of the entire loan for the entire period. Consequently the rate of interest paid is approximately double what most people would think it to be. If, for example, you are borrowing money at 6% on the entire amount, to be repaid in equal payments, the rate of interest is not 6%, but practically 12%. But even at that price the use of the money can still be a good value in an emergency.

Financing a repair job has real value the same as doing the job has value. And each worker, whether banker or mechanic, is entitled to a reasonable return for the service that he renders.

But the point is, as was originally mentioned, that financing is as much of a specialty as is the mechanical work.

REPAIRS UNJUSTLY CONDEMNED

Experience indicates, for example, that if the service man tries to be a "good fellow" that some customers will take advantage of him. We have seen many cases where a perfectly good repair job was condemned for one reason or another on or about the first of the month, when each payment was due. There was nothing in the world wrong with the job as such, but the customer was trying frantically to think up some reason why he should not pay what he owed.

We are not arguing with the idealist's claim that most people are honest—perhaps most people are. We hope so. At the same time, it is bad business—and unnecessary—for the service man to throw away his profits by extending financial assistance to those who do not deserve it.

Perhaps you have seen a customer who was long on promises but short on cash who would run his credit up as high as he could at one shop. Then when this shop would no longer "carry" him he would give his business to a competitive shop and pay cash.

It's off the subject a little bit, but the cure for this problem is to have a good service association, to know your competitor, and to exchange information on this type of customer.

DRIVES OUT WITHOUT PAYING

We even know of one shop where a customer brought a car in for a valve job. He certainly needed it, but when the engine was opened it was quite clear that pistons and rings were needed also, and anybody could guess that rod bearings should be replaced at the same time. So what had started out as a relatively small job took on

"IT SEALED THE SALE!"
INSPECT and PROTECT
JACK, WHY DIDN'T YOU TRY TO SELL THAT LADY ON CHECKING HER OIL SEALS?
GOSH, BOSS—YOU CAN'T TELL A WOMAN ABOUT A THING LIKE THAT! SHE JUST DOESN'T "DIG" IT.
EVERY
THE TROUBLE IS, YOU DON'T KNOW HOW TO GIVE HER A REAL SALES TALK! WELL, HERE COMES ANOTHER ONE...
JUST A FEW MINUTES...SAY, LADY! HOW'D YOU KNOW SO MUCH ABOUT 'EM, ANYWAY?
HA, HA! IT'S THAT DISPLAY RIGHT BEHIND YOU...I WAS READING IT OVER YOUR SHOULDER ALL THE TIME!
GOSH, I DIDN'T EVEN KNOW WE HAD IT...WHY, RIGHT HERE'S A WORN SEAL—AND OVER THERE'S A GOOD ONE. YOU CAN TELL THE DIFFERENCE YOURSELF.
HERE'S YOUR CAR, ALL FIXED, LADY! THIS FRONT WHEEL INSTALLATION TOOL FROM THE C/R KIT SHOWED ME JUST WHERE THE SEALS WERE WORN. THEN I FOUND THE NEW ONES IN MY C/R CABINET IN NO TIME...

the proportions of a major overhaul.

The customer was immediately contacted and the complete story given to him. The customer concurred with the shop's findings and authorized the needed work to be done—*but arrangements for paying for the job were not discussed at the time.*

A few days later, when the job had been completed, the customer stopped by the shop and mentioned to one of the boys on the floor that he would like to take the car out to see how it performed. It performed fine—so fine, in fact, that *he drove it home!*

The following day when the owner of the shop happened to see this car parked on the street he slipped a jumper onto the ignition and drove the car back to his place of business. That was a bad move on the part of the shop owner. Not only had this slippery customer gotten away with this big job without paying, but he now signed a complaint with the police that his car had been stolen. The police were not interested in the merits of the case—merely the technicalities—and the shop owner was in for a hard time.

There is a way to avoid problems such as the foregoing. First of all, try to organize some system so that a good-hearted porter or sweeper does not become the victim of a crooked customer. Then, if the man cannot or will not pay for the work that he ordered, check immediately with a *local attorney.* A mechanic's lien against the repaired vehicle can generally be executed and the car stored —perhaps at a regular storage garage —until this lien is satisfied.

CHECK CREDIT FIRST

Of course, such drastic procedures do not build goodwill. So it is certainly not likely that this customer would return at any future date, after having satisfied the lien. But he wouldn't be back anyhow after having sneaked out.

So the better basis by far is to inquire into a customer's credit rating *before* proceeding on any job that is likely to run into much money. Just how big a bill constitutes "much money" could be a local or personal matter. Some folks in speaking of gambling say that one should never gamble more than he can afford to lose. We don't know who can afford to lose anything, but all business must be more or less of a gamble at times, so perhaps you can set a limit in your own shop.

There are well over 2,000 credit bureaus or similar organizations in the United States and Canada. They render an important service to all business men. Perhaps we should say that they are prepared to render an important service.

A person wishing to establish his credit standing will be asked by the bureau to fill out both sides of an application form. The information will then be on file at the local credit bureau, and this bureau (listed in the phone book) can give a report to you on your customer. Naturally there's a charge to you by the bureau for this report.

A WORTHWHILE SERVICE

Each bureau member subscribes to a contract negotiated on an annual basis payable to the bureau monthly, quarterly, semi-annually, or annually. The rates may vary in different parts of the country. In some areas it is $5.00 a month or $60.00 a year.

All data are filed under the name of the individual being reported on. These data include all information necessary to establish credit.

It is not meant by the foregoing that the shop owner should neces-

(Continued on page 78)

THIS NEW C/R OIL SEAL DISPLAY JUST CAME. I'LL PUT IT UP RIGHT NOW.
UH...Y'SEE, LADY—THESE OIL SEALS...UH...
I SUPPOSE YOU'RE TRYING TO SAY I SHOULD AVOID COSTLY REPAIRS TO MY FRONT WHEEL BEARINGS?
(GULP) YEAH! THAT'S IT—AND...
...AND I SHOULDN'T TAKE A CHANCE ON OLD WORN-OUT SEALS BECAUSE THEY DRIP?
WHAT'S GOING ON HERE?
LEAK IS THE WORD, LADY. DIRT IN THE BRAKE DRUM WEARS THE SEALS DOWN UNTIL THEY LEAK. GREASE GETS OUT ON THE BRAKE LINING—CAN MAKE THE BRAKE SLIP AND CAUSE ACCIDENTS.
WILL IT TAKE LONG TO CHECK MY SEALS?
BOSS—I SOLD THAT LADY A SET OF OIL SEALS! THE DISPLAY SURE HELPED HER "DIG" ME.
YEAH—IT EVEN HELPED HER DIG A REAL SALES TALK OUT OF YOU!

Get your FREE SALES BUILDING DISPLAY

Return the registration card—postpaid—received with your C/R stock cabinet to get this display and other C/R merchandising helps or contact your C/R supplier. Ask him about the bonus oil seal kit.

Remember—
ALWAYS REPLACE NEVER RE-USE!

C/R
CHICAGO RAWHIDE
SERVICE SALES DIVISION
ELGIN, ILLINOIS

Automatic transmissions

A complete series of articles covering automatic transmissions — their design . . . how they operate, and how they are serviced. Be sure to read and keep all future articles for ready reference.

Part VI—Servicing the PowerFlite

BY HERB CARRIER
Detroit Editor

• FLEXIBILITY, ENDURANCE, and dependability, are the keynotes of Chrysler built automatic transmissions. Both PowerFlite and TorqueFlite (PowerFlite's big brother) are noted for their ability to provide maximum efficiency with outstanding ease of driver control.

So popular are Chrysler automatics that, "99.3 per cent of all DeSotos sold in 1957 were equipped with 'push button' transmissions," according to J. B. Wagstaff, DeSoto vice president.

This customer preference is also demonstrated in all other makes of Chrysler-built cars. It's interesting to note that even professional "Thrill Drivers" prefer automatic to standard transmissions—and with these drivers, a high performance transmission is a must.

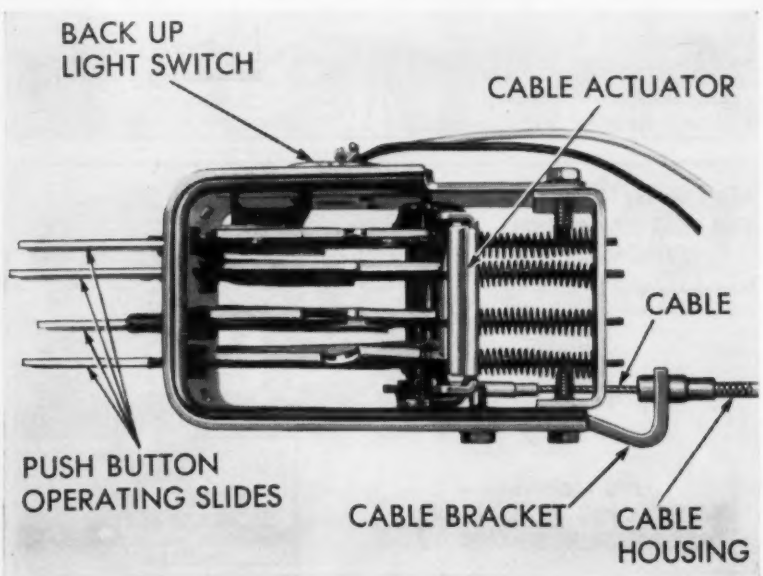
POWERFLITE CONSTRUCTION

PowerFlite consists of a torque converter, a clutch assembly, two planetary gear sets, and the necessary housings and control systems.

The torque converter has four basic parts: An impeller, a turbine, and two stators—a primary and a secondary.

The impeller, which forms the outer shell of the converter unit, is driven by the engine. The turbine, which is splined to the transmission input shaft, is driven by the oil forced from the impeller vanes.

The stators, located between the turbine and the impeller, redirect the flow of oil as it leaves the turbine and returns to the impeller. The redirected oil strikes the impeller vanes in such a manner as to give it an extra boost. This is the reason why the PowerFlite torque converter is capable of producing a maximum torque multi-



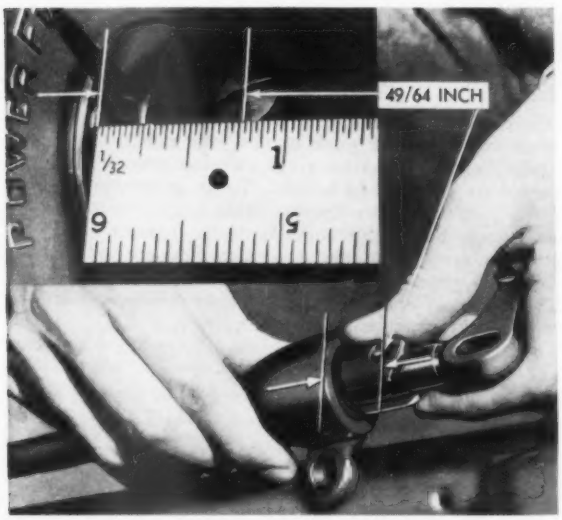
Speed range selector, mounted behind the dash panel, contains a cable actuator to transmit push button action to the control cable. The range selector requires no lubrication or adjustment. Note the location of back up light switch.

plication of 2.6 to 1 on 6-cylinder models, and 2.7 to 1 on 8-cylinder models.

For example, if the 6-cylinder engine develops 100 ft. lbs. of torque, it's possible for the torque converter to deliver 2.6 times this much, or 260 ft. lbs. of torque. This is true only under a stall condition. As engine r.p.m. increases, torque multiplication rapidly falls off to a point where it is 1 to 1.

STATOR OPERATION

The use of two stators, instead of the more conventional single stator, makes Chrysler automatics somewhat unique. The stators are both mounted on overrunning clutches to permit stator rotation only in the direction of turbine and impeller rotation. The main difference in two stator operation, as opposed to the one stator type which



A 49/64" dimension must be established between the centerline of the selector lever bearing bolt and the rod bracket on the steering column. Adjustment is made by removing the bracket and cap, lowering the steering column slightly, removing the screw and rotating the bracket sleeve until proper distance is obtained.

we have discussed in earlier articles, is the progressive manner in which the two stators cut in.

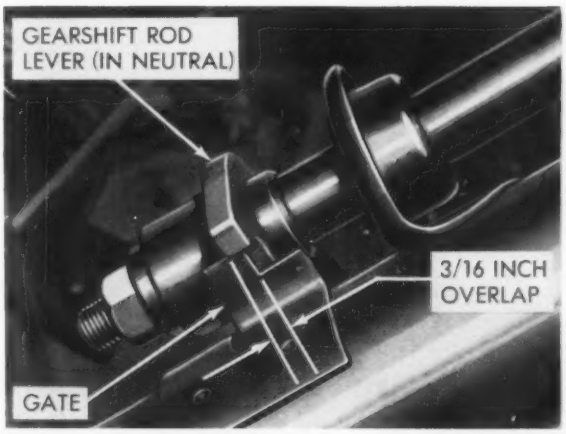
For example, starting from a standstill, both stators are held stationary by high velocity oil discharged from the impeller striking the front face of the stator vanes and forcing them against the stops of the overrunning clutches. As engine speed increases, the angle of the oil leaving the turbine gradually changes so that it strikes the primary stator on the back side of the vanes. This causes the stator to begin rotating in the whirling oil mass in the same direction as impeller and turbine.

The secondary turbine remains stationary until a further increase in engine speed causes a still greater change in the direction of discharged oil. Then it, too, begins to rotate along with the primary stator. When this happens, no further torque multiplication exists and the unit operates at a ratio of approximately 1 to 1.

Later model PowerFlites use only a single stator. The torque converter is a welded unit, and can be serviced only as a complete assembly.

THE TRANSMISSION UNIT

Mechanically the transmission unit is composed of two planetary gear sets, a multiple disc clutch, a kick-



A 3/16" overlap of the gearshift rod lever on the gate (mounted on steering column) is one adjustment of the selector lever. This overlap must exist when the selector lever is in the neutral or drive positions.

down (front) band, and a reverse (rear) band.

Each planetary gear set has an annulus gear (also known as an internal gear), a planet carrier which contains three pinion gears, and a sun gear.

HOW IT OPERATES

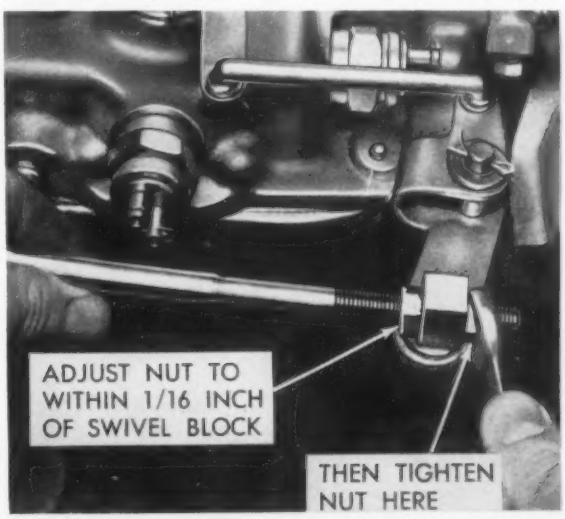
Drive (start): Kickdown band is applied to hold the sun gear of the kickdown planetary gear set stationary. This causes power flow from the turbine through the transmission input shaft to the annulus gear of the kickdown planetary set and to sun gear of the reverse planetary set.

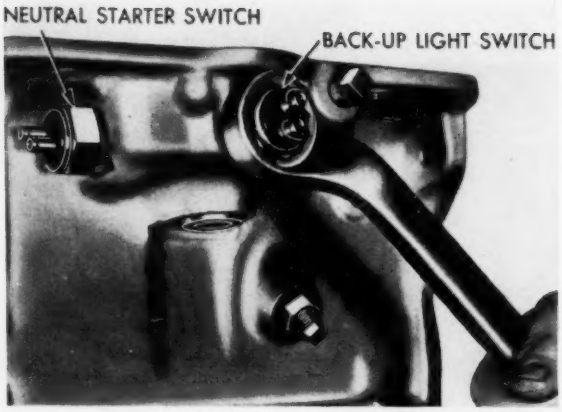
In effect, both planetary units are in reduction, and the transmission is in LO gear with a gear ratio of 1.72 to 1. This ratio, multiplied by the 2.6 to torque multiplication of the torque converter, equals a starting ratio of 4.47 to 1 at the transmission output shaft.

Drive (upshift): Upshift to direct drive is accomplished

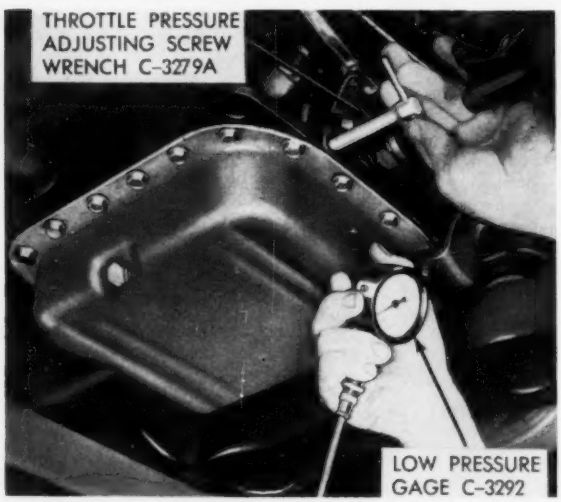
(Continued on following page)

Final step in selector lever adjustment is to hold selector lever on steering column in neutral position and draw up front locknut on control cable to 1/16" of swivel block. To complete adjustment, securely tighten rear locknut against swivel block.

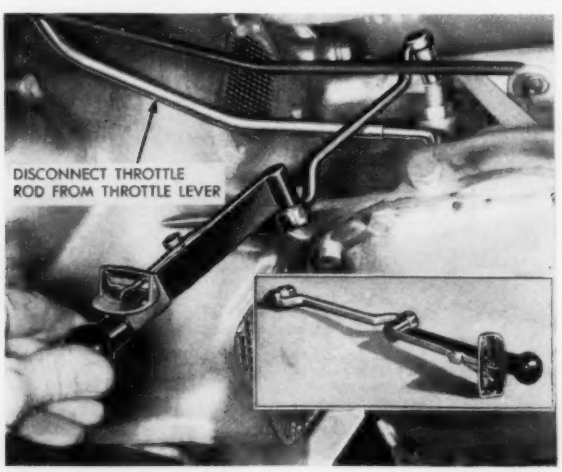




Starter neutral and back up light switches are located on transmission housing. When replacing these switches, use a clean container to catch transmission fluid which will drain from threaded hole. On push button transmissions, the back up light switch is located on the range selector.



A throttle pressure adjusting screw wrench and low pressure oil gage are used to adjust throttle pressure, which must be within specified limits before adjusting throttle linkage. A pipe plug is removed to gain access to the adjusting screw.



Kickdown band adjustment is made on exterior of transmission case. After loosening locknut, adjusting screw is torqued to specifications then accurately backed off. For ease of adjustment, throttle rod can be disconnected from throttle lever. Inset shows special inch-pound torque wrench and adapter used.

Automatic Transmissions . . . CONTINUED

by releasing both bands and applying the clutch. This locks the front planetary sun gear with the input shaft, and results in a 1 to 1 gear ratio.

Reverse: To reverse rotation of the transmission output shaft, the reverse band is applied to lock kickdown and the reverse planet carriers stationary.

The clutch and the kickdown band are disengaged. In reverse, the gear ratio is 2.39 to 1.

Neutral: Both bands and the clutch are released to allow the gears to spin without transmitting power.

Lo and Kickdown: These two ratios are identical in application to the DRIVE position when the vehicle starts to move. In LO the transmission will not upshift. Kickdown is automatic up and down according to throttle pressures.

SERVICE ADJUSTMENTS

Chrysler Corp. must be given credit for starting the current swing toward push button gear selection. Prior to 1955, most automatics employed the selector lever mounted on the steering column. Today, a good share of all cars with automatic transmissions employ some system of push button control. However, there are many that do not use buttons, and also many Chrysler cars built before 1955 which are equipped with selector levers. For the service mechanic, it is important to understand both lever and button adjustments.

SELECTOR LEVER ADJUSTMENT

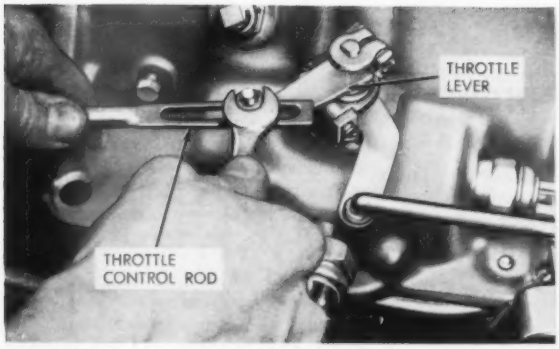
Distance between center of selector lever bearing bolt and steering column shift rod bracket should be 49/64″ to provide adequate lever overlap (3/16″) on the gate at lower end of steering column when selector is in NEUTRAL and DRIVE positions.

To adjust, remove bracket assembly at selector lever, and bracket cap at the dash. Lower column slightly to gain access to oval head machine screw. Remove lever, spring and pointer. Slide bracket assembly downward until it can be rotated. Adjust bracket sleeve to 49/64″ distance from the center of screw hole to edge of bracket. Then reinstall assembly.

Adjust gearshift rod lever stud to center of lever slot. Raise car and loosen two nuts which hold gearshift control rod to swivel block attached to the gearshift control bellcrank. Remove block and control rod from bellcrank. Position transmission control lever in REVERSE. Then move it forward one detent to NEUTRAL. Install swivel block, but do not tighten control rod nuts. Hold selector lever in NEUTRAL position and run front nut up to 1/16″ from swivel block. Complete adjustment by running down the top nut to securely lock swivel in position. Check selector lever in all quadrant positions.

PUSH BUTTON ADJUSTMENT

PowerFlite push button control is a clear, simple unit which is easy to adjust—adjustment is made at transmission end of a single push-pull cable. To adjust, loosen the cable bracket screw, and have someone hold the L



One of the most important linkage adjustments is the connection between throttle control rod and transmission throttle lever, to assure that any movement of accelerator pedal will result in a proportional increase of engine speed and throttle pressure. A long slot in the control rod provides ample adjusting room.

(LOW) push button in its full length of travel to remove backlash from cable actuator. Position cable bracket in recess on the cable and tighten the screw to complete adjustment.

The close working relationship between accelerator position, vehicle speed, and transmission throttle pressure requires careful, accurate adjustments. An oil pressure gauge, tachometer, and a special adjusting tool must be used to obtain dependable settings.

Thoroughly warm engine and adjust idle to 475-500 r.p.m. (OFF fast idle cam); stop engine; arrange tachometer leads for use under car; start engine, (leave in NEUTRAL), and raise vehicle.

Remove throttle pressure plug (⅛" pipe plug), located on right side of transmission. Connect oil gauge. Move control lever on transmission forward one detent to place transmission in DRIVE. Disconnect throttle linkage at transmission lever, and operate lever several times. Pressure should be within 13-15 p.s.i. with lever returned to its stop.

If adjustment is required, remove ⅜" pipe plug on left side of transmission. Have clean container available to catch the quart of fluid which will drain when plug is removed. Insert adjusting tool and turn screw to obtain correct reading. Counter-clockwise increases pressure; clockwise decreases pressure. When pressure is within limits, remove tool and gauge, and install plugs, and tighten them securely. Lower vehicle, remove tachometer, and install fluid which was drained from adjusting hole. If fluid was not handled carefully in a *clean* container, install one quart of fresh fluid. After pressure adjustment, adjust throttle linkage.

V-8 LINKAGE ADJUSTMENT

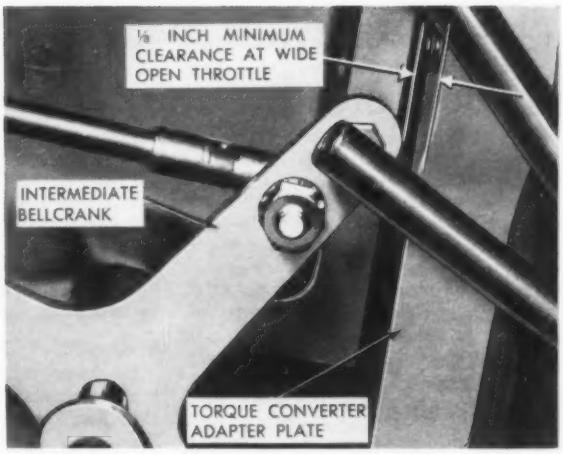
Loosen clamp nut on throttle control rod. Slide rear part of rod toward rear of car to remove all slack. Then securely tighten clamp nut. (*Note:* Be sure carburetor is *off* fast idle cam.)

6-CYLINDER ADJUSTMENT

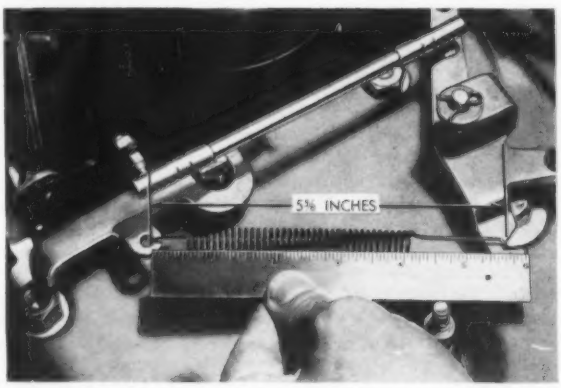
Loosen vertical clamp rod and adjust carburetor lever

(Continued on page 69)

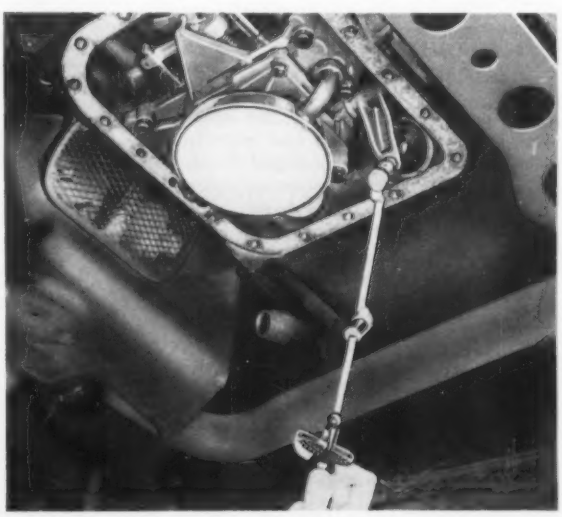
To make adjustment on reverse band, it is necessary to remove transmission oil pan. A special inch-pound torque wrench and adapter are available for easy access to the adjusting screw. Inasmuch as back off on band adjusting screw is critical, chalk or colored pencil should be used to establish an accurate reference line.



At wide open throttle, a ⅛" clearance between intermediate bellcrank arm and front face of torque converter adapter plate must be maintained. Adjust the vertical rod as necessary to obtain specified clearance. This adjustment must only be made as part of the complete throttle linkage adjustment procedure.



A steel scale is used to measure the distance between anchor points of the throttle spring. On late model cars, the 5⅝" dimension has been changed to 5-7/16". Adjustment is made by varying the length of the throttle rod between the carburetor lever and bellcrank.



Chrysler festivities mark milestone in broad service education program

• AN UNUSUAL birthday party at Centerline, Mich. last month marked the 10th anniversary celebration of the Chrysler Corp. Master Tech service training program. "Little Tech," symbol of the educational activity, was royally feted. There was a mechanical "cake"—made entirely of carburetors, spark plugs, pistons, cylinders, connecting rods and other automotive parts—for the little mechanical man, which appears in the program material and is the symbol of the program. He occupied the seat of honor at the festivities. For the many guests, there was the customary "eating" type of cake, and a report on the results of the program.

RAISES WORK QUALITY

Describing Master Tech as the automotive industry's largest single continuous training project, the firm announced that more than 225,000 mechanics and service technicians—in United States and 74 foreign dealerships—have received instruction. Currently, some 38,000 are participating. According to Philip B. Hopkins, company director of service development and training, dealers are enthusiastic about the program: "Master Tech saves them time in training new technicians, keeps experienced mechanics up-to-date and improves shop earning power.

"More important," he added, "the Master Tech program raises the quality of service work, resulting in more satisfied customers who will return to the dealership for their next new car purchase."

COURSE CONTENT

Master Tech headquarters is Chrysler's training center north of Detroit, from where information on the latest service practices spreads out to dealerships as distant as Arabia and South Africa. Regional service and sales training centers are now being built near Chicago and Los Angeles, at Rye, N. Y., Atlanta, Ga., and Newark, Del.

Every month, a compact instruction kit covering a new service subject goes out by mail to dealers participating in Master Tech. Dealer service managers or conference leaders conduct study sessions on a regular meeting day each month; and all members of the service staff are encouraged to attend.

Each kit treats a different phase of automotive operation and maintenance; and consists of slide film and instructional recording, charts, meeting guide, reference books and questionnaire. Subjects range from adjusting headlights to installing tail pipes—literally from stem-to-stern and top-to-bottom of the car.

REWARDED FOR EFFORTS

In study sessions, the conference leader demonstrates the steps that the slide film and recording have covered. He uses a car and/or the part discussed in his conference presentation. Members of the group then review the reference books provided; and a general discussion period follows. Each member then performs the operations he has seen performed on the screen and demonstrated by the conference leader. At the conclusion of the meeting, class members complete questionnaires covering the subject matter of the session. These are forwarded to headquarters for grading.

Individuals who satisfactorily answer the questionnaire for each of twelve consecutive Master Tech sessions receive a plaque. Additional awards such as lapel pins, are given for each subsequent 12-month period completed. Conference leaders also earn awards for successive yearly terms they direct; and dealers are given wall plaques for continuous participation.

WORK OF ADVISORY COMMITTEE

"Little Tech," a small mechanical 'man,' appears in the step-by-step slide-film explanation of the current service subject. He also provides light touches to each session with quips and side remarks. Selection of study subjects and preparation of the courses is handled by an advisory committee consisting of the director of service training and the service directors of the automotive divisions; representatives from Engineering, Service Parts and Accessories, the Export Division and Chrysler Corp. of Canada, Ltd.

Translations of Master Tech program materials have been made in Spanish, French, German, Swedish, Flemish, and Japanese. Current conferences include more than 1,000 being held abroad in such countries as Belgium, Sweden, India, Egypt, Mexico, Greece, Turkey, Australia, South Africa, and Arabia.

INCIDENTAL STATISTICS

Since it was introduced in 1947, Master Tech has rolled up some interesting figures in course materials. For example, it has used 11,132 miles of 35 mm film—enough to reach in one continuous strip along the highway from Boston to Jacksonville, to Los Angeles, to Seattle, back to Boston and return trip to Seattle.

It has produced enough records—840,000 of them—to play night and day for 28 years, 9 months without pause for changing; turned out 5,760,000 reference books, totalling 300 tons; and 840,000 charts. The charts required 70 tons of paper, and joined end to end would reach the 477 miles from New York to Akron, Ohio; or they could be used to carpet 113 football fields, sideline-to-sideline and goal line to goal line.

"Torch light" ceremony at Little Tech's 10th birthday celebration. Lighting the candles of the mechanical cake—with a blowtorch: Philip B. Hopkins, Chrysler's director of service development and training. With him are (clockwise) division service directors George Cutler, Plymouth; R. L. Shaffran, Export; C. T. McClure, Chrysler; J. A. Dykes, Chrysler Corporation of Canada, Ltd.; R. W. Utley, De Soto (missing the fun—W. M. Spencer, Dodge).

Sell Precision!

● GONE ARE THE DAYS when customers speak of automotive maintenance men as "grease monkeys." But the average motorist still has no concept of the precision with which engine work and other services are performed.

A human hair measures somewhere between .002" and .003", and the average motorist has the idea that a part fitted to a "hair's breadth" represents real precision. In engine work this would be pretty crude. So when the opportunity presents itself, *show your customers your inside and outside mikes, your dial gauges and feeler gauges.* They'll be impressed.

Precision-minded mechanic assembling inside mike to check cylinder bores for taper and out-of-round.

Here for example is an engine job where an inside mike is being set up to check cylinder out-of-round and taper. The measurements will be exact down to ½-thousandth. This accuracy means measurements down to *one-fourth the diameter of a human hair! That is precision.*

When your customers understand the precision to which your mechanics work they will have a new respect for their ability and a greater willingness to pay for it.

TorqueFlite Noisy During "Breakaway"

If owners of 1957 and '58 TorqueFlite equipped cars are experiencing excessive noise during "breakaway" push button "D" position, especially when coasting or decelerating, the Chrysler Service Department states it may be caused by the condition of the needle roller thrust bearing, the sungear rear end thrust face, and the front thrust surface of the intermediate shaft flange.

When inspecting the parts of a disassembled TorqueFlite transmission, examine carefully the needle roller thrust bearing for wear, scores, looseness and cage wear or damage and install new bearing if necessary.

Check the sun gear rear end thrust face for wear, pits, scores or unevenness. If the wear pattern is not uniform, or if the thrust face shows signs of pits, wear or scores, install a new sun gear.

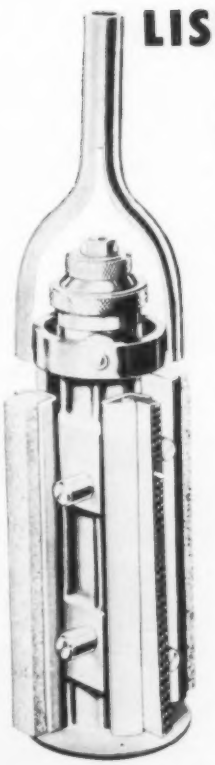
The intermediate shaft flange should be carefully inspected for wear, scores, pits or breakthrough of the case hardness, and if found to be defective, a new intermediate shaft should be installed.

Inspect the intermediate support bushing. If it shows definite wear pattern at front and rear edges and 180° apart, replace the intermediate support and cam assembly.

Closely examine the intermediate shaft rear clutch feed circuit seal ring lands. If worn by contacting the reverse sun gear inside diameter, replace intermediate support and cam assembly.

In addition, inspect all thrust washers in the transmission, and replace with new washers where needed. Be sure to obtain the correct end clearance on assembly as described in the factory service manual.

$10 TRADE-IN ALLOWANCE on the CH-45 LISLE CYLINDER HONE!



Yes, right now any old cylinder hone is worth a full $10.00 trade-in allowance on the new Lisle CH-45.

Or, you can get a $7.50 allowance on the Lisle CHJ small engine hone.

Either one, they're both big values you'll want to get in on while this special offer lasts.

CH-45—EXCLUSIVE ADVANTAGES

- 2-11/16 to 4½" range. Expands to 2.6 to 10" with just 3 extra stone sets.
- Quick expansion plus micrometer feed assures accuracy and speed.

CHJ—This quality-built hone handles the growing foreign car market as well as other small engine cylinders: 1¾ to 2.6" range.

CHECK WITH YOUR JOBBER TODAY!

He'll tell you about the trade-in deal and why the Lisle CH-45 and CHJ are best for your needs.

it's a good tool...it's a Lisle

LISLE CORPORATION
CLARINDA • IOWA

Annual inter-industry check-up campaign will sell both public safety and service

• CAN YOU SEE, steer and stop safely? That's the challenge to be raised to motorists in May, throughout the 34 states that do not have an official program requiring periodic motor vehicle inspection. Before the month is out, millions of windshields will proclaim the answer shown below: the red-on-white "Safety-Checked" symbol, signifying that the owner has enlisted in the voluntary national drive to "Back the Attack on Traffic Accidents."

Even in the 14 states which, with the District of Columbia, require Safety-Checks by law, public attention will be focused on the need to maintain automobiles in safe driving condition at all times. Community activity of this type will supplement official public safety efforts.

Under sponsorship of the Inter-Highway Safety Committee, and in cooperation with automobile and tire manufacturers, National Automobile Dealers Association, National Tire Dealers and Retreaders Association, the 1958 National Vehicle Safety Check will stress the theme, "**Circle of Safety.**" Civic, business, safety and associated organizations will participate on a local and nationwide level; state and local police and public officials, all segments of the automotive service industry, the Association of State and Provincial Safety Coordinators, and the National Safety Council, are enlisted among cooperating groups in the nation-wide drive.

Writing on the campaign theme, M. R. Darlington, Managing Director, Inter-Industry Highway Safety Committee, points out:

"Everybody wins in the May Safety-Check! Motorists get a free check of the condition of their cars; automotive businessmen share in an increase in demand for parts and service; and all benefit when safer vehicles are using our streets and highways . . .

"The Annual May Safety-Check gives many motorists tangible proof that they need to keep their cars in safe driving condition. A report on the 1957 Safety-Check, from Salinas, Kansas, reads: 'One vehicle was found to have three bad tires. The party concerned drove on into town after being checked the first time, and had three new tires put on his vehicle for the purpose of obtaining an okay sticker.'

SAFETY IS GOOD BUSINESS

"ONE out of every FIVE of the more than 2½ million vehicles safety-checked last year needed immediate attention to one or more of the 10 major items affecting safe driving."

The free inspection offered motorists covers: brakes, front and rear lights, steering, tires, exhaust system, glass, windshield wipers, rear view mirror and horn. Automotive servicemen find that new business follows as a natural consequence when drivers are made aware of the importance of keeping their cars in good condition, according to Darlington. Thus, he points out,. Vehicle Safety-Checks constitute a public service traffic safety program that boosts sales.

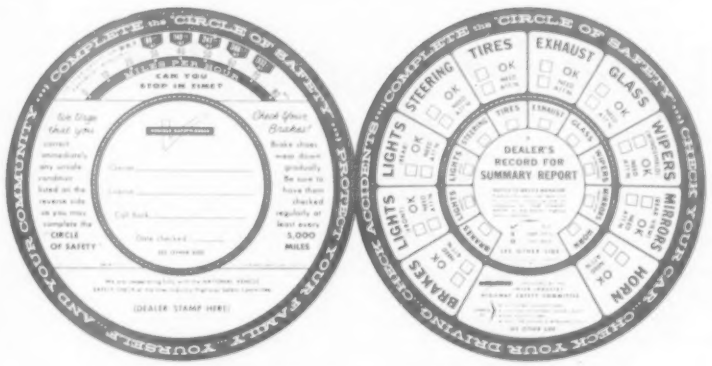
Since only 14 states and the District of Columbia require regular inspection of vehicles, the opportunity for building business through this type of public-spirited activity is widespread. All of the automobiles in the other 34 states—and they comprise two out of every three in the nation—are potential traffic hazards. The free voluntary Safety-Check derives additional public acceptance by its timing . . . May being the month just preceding summer and vacation travel.

EFFECTIVE PROMOTION

Last year approximately 1300 cities and counties cooperated in positive action against traffic accidents by establishing check lanes at convenient locations, in order to provide local inhabitants with the free service. Businessmen, civic groups, public officials and individual citizens worked together in support of the program. Where no community effort was generated, service shops and dealers often provided the same 10-point Safety-Check at their business location.

1958's campaign is promoting safe driving as such, as well as safe automobile condition. Supporting its **Complete the Circle of Safety** theme, promotional materials urge drivers to 'go

Community check lanes such as shown below will dot the nation during May's annual "Safety-Check" drive. As in the past, automotive service establishments will provide the skilled personnel to put teeth in the public safety voluntary inspection drive. Motorists will receive a free check of ten key items affecting driving safety. Cars in safe driving condition will be identified with the official symbol of "Circle of Safety" compliance, the three-inch diameter red and white sticker shown at the left below.



HOW SERVICE SHOPS ARE PARTICIPATING

1. Identifying shop as Safety-Check center by appropriate displays.

2. Cooperating with local groups in planning and manning check lanes.

3. Writing regular customers an offer of the 10-point check on every vehicle entering the shop during the Safety-Check Month.

4. Featuring "Safety Specials" throughout May, and cautioning customers about the personal hazard resulting from unsafe vehicle condition.

5. Using Safety-Check campaign materials, such as the above "Circle of Safety" check list report for the motorist (it's hung in car after check). Perforated center is easily punched out to provide shop with a follow-up record; customer section provides space for shop identification.

6. Keying any local advertising to the National campaign and using the slogans and Safety-Check theme.

7. Completing and forwarding to the Inter-Industry Committee office, reports on the number of vehicles checked and number needing work.

8. Advising the Committee also of the results of local promotion, such as publicity stories run in the community, and forwarding samples.

the whole route': "Check your Car—Check your Driving—Check Accidents." An example of the effective promotional materials being used in the current drive, is the wallet-size "Family Car Facts" membership card given the owner of the vehicle.

When signed by the motorist, the card identifies him as a member of the Circle of Safety, and gives him a handy reminder of important details. Spaces on the reverse side provide for entry of make, model, year, engine and key serial, as well as license numbers; insurance information; tire size and recommended pressure; name and phone number of his service shop. It also provides for recording gas and oil suggestions, and number of miles between checks and various services.

Servicemen may complete the card for the driver as a courtesy and business-builder. Long after the current drive is concluded, the cards can be used for other regular customers or buyers of new or used cars.

Other promotional materials include window trim, identifying the shop as a Safety-Check center, the novel die-cut "Circle of Safety" report (shown here), danglers, dimensional displays and service department "action prod-ders," bumper stickers, and give-aways. There will be broadscale advertising support on radio and TV, and in newspapers and magazines, by national firms and local dealers and automotive products outlets.

PROGRAM IS NEEDED

Discussing the importance of the May Safety-Check campaign, Darlington stressed the necessity of arousing public awareness to the need to maintain vehicles in proper driving condition, and to check the key safety factors regularly. He points out that 20 million of the passenger cars in operation are more than 5 years old—with an average of 5.6—and 11 per cent of trucks on the highways are pre-war models (Source: Automobile Manufacturers Association).

Darlington added that more than 48 million vehicles regularly using our streets and highways are based in areas that do not provide for official safety inspection.

Illustrating both the need and the impact of the campaign on service business volume, is the comment of the chairman of one outstanding 1957 community drive, that of Bismarck, North Dakota. "It was interesting," he wrote, "to find that approximately 20 per cent of the vehicles checked had one or more of the ten key items in need of service. Many service centers in our area ran out of such parts as light bulbs, brake switches, windshield wipers, etc.; and a few had a big run on mufflers by the end of the second day."

This year, Darlington reports, automobile and tire companies have loaned the Inter-Industry Highway Safety Committee the services of 20 men for March, April and May. They are assisting local groups. The Inter-Industry Committee itself serves as National Headquarters for the May Safety-Check campaign, and provides participating communities with "how-to-do-it" and promotional materials. Further information is available from the Committee office: 1200 Eighteenth St., N.W., Washington 6, D.C.

WHEN CHANGING YOUR ADDRESS

Please notify us 5 weeks in advance. Supply us with both your old and new address, including address label from current issue if possible. Copies we mail to your old address will not be delivered by the Post Office unless you pay them extra postage. **Mail address changes to Circulation Dept., Automotive Service Digest, 900 South Wabash Ave., Chicago 5, Ill.**

Photo Showing Manner in Which the BPS Choke-Stove is Mounted Onto Automobile Manifold.

choke-stove
(Patent Pending)

Exclusive "con-tourfit" with asbestos pad to assure air-tight seal. (pat. pend.)

Trademark Copyright 1957

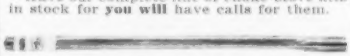
Choke-Stove mounting strap. (Uses one manifold bolt.) No holes to drill.

STOP CARBURETOR TROUBLE ON FORD, LINCOLN, MERC., OLDS., CHEV.

Fits all 1955-57 Ford Products, 1957-58 Chevrolet, 1956-58 Oldsmobile.

Chevrolet 1957-1958 and Olds 1955 thru 1958 have the same tube that is giving so much trouble on the 1955 thru 1957 Ford products.

Have our complete line of choke-stove kits in stock for **you will** have calls for them.



Even when the above tube is new and good it gives trouble. This tube is engineered to heat up choke-housing very quickly, but on a hot day or long pull the air passing thru this pipe gets too hot and causes gasoline in carburetor bowl to boil, making excessive gasoline fumes and hard starting—particularly the Olds.

Forget original heat tube. **$5.95 LIST**

Eliminates . . .

- Sticking choke
- Plugged air passages
- Wasted gas
- Complete carburetor failure

Send name, address of your jobber. We pay all freight.

BRAKE PARTS SPECIALTY
1914 W. Washington, Los Angeles 18, Calif.

How to prevent cylinder head leaks

• FROM TIME TO TIME we have received letters from readers on the subject of coolant leakage into the engine. It seems that these mechanics have done a first-class mechanical job, only to have a customer bring the car back in a short time complaining of poor engine performance.

A careful investigation reveals in many instances that the customer's complaint is justifiable, and that the trouble is due to a leaking cylinder head, or heads, as the case may be. And as we all know, such come-backs are costly to the shop—and the mechanic.

TAKES MORE THAN "PULL"

As one mechanic recently wrote us, ". . . we're really careful, and tighten every head so tight we just don't see how they can possibly leak . . . but they do." So let's take the time to look at the requirements necessary to spell the difference between failure or success on a job which necessitates head removal.

We must realize that with the lighter weight cylinder heads being used on today's high-compression engines machined to a flat tolerance of .001", and with head gaskets that more nearly resemble a piece of shim stock, there's a lot more to proper head tightening than pulling up the bolts to a specified torque. But let's begin at the beginning.

CHECK HEAD FOR WARPAGE

Being careful to avoid nicking or scratching the machined surfaces of the head or block is the first step in heading off future trouble. And the very next step is to scrape each machined surface absolutely clean of any old gasket or gasket cement.

Now check the head with a straight edge and feeler gauge to see if it has become warped. To do this, lay the straight edge on the head diagonally from corner to corner. Take a .005" feeler blade and see if you can slip it in anywhere between the straight edge and the machined surface of the head. Now change the straight edge to go diagonally across the head between the other corners. Again see if the feeler blade will go under the straight edge. Finally, lay the straight edge right down the middle of the head from end to end, again using the feeler blade to check for warpage. If the blade will go under the straight edge on any one of these tests, it means that warpage is present, and that the head should be machined true.

CHECK THOSE BOLTS

Before going any further, make an inspection to see whether the cylinder bolts pass through into the water jacket or into the intake manifold ports. To assure a good tight seal of the threads, clean each bolt with a wire brush, and then coat the threads with a thin application of non-hardening gasket cement or thread seal. On those bolts that go into the intake manifold ports, be very sparing with the cement, and do not apply it all the way to the end of the bolt. If you do, there is a possibility that a little of this cement could be drawn into the intake valve with unpredictable but unsatisfactory results.

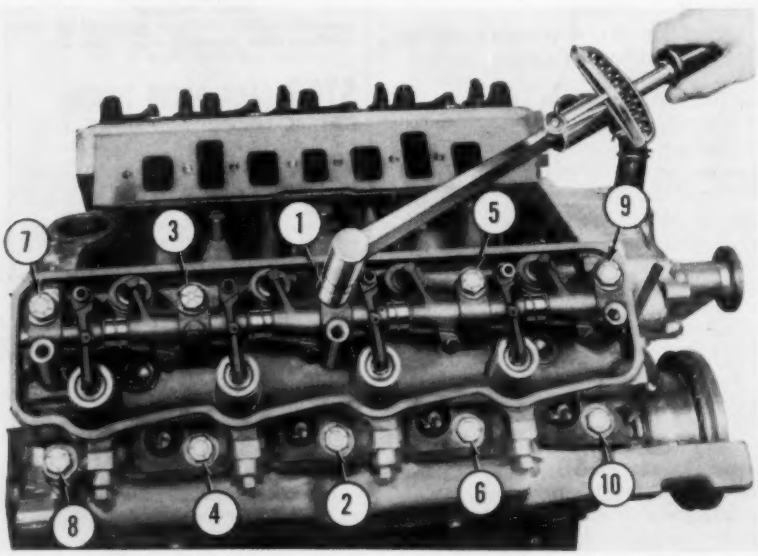
HOW TIGHT IS TIGHT?

Going back for a moment to the mechanic's statement, ". . . and tighten every head so tight we just don't see how they can leak . . .", it is pretty evident that in his efforts to get a perfect seal between the head and block he was, in reality, over-tightening the headbolts.

When a bolt is pulled up too tight, it may pull up the metal of the block and form a ridge on the block surface around the bolt hole. This may seem unbelievable, but there have been several instances where a mechanic has had to remove all studs where head gasket leakage persisted, and make a check for raised metal at the bolt holes.

To remove these high spots, stuff oily rags into the cylinder bores to keep out filings, and use a large smooth flat file—with finger-tip pressure—and file the surface around the holes flat. As an extra precaution, many mechanics chamfer the bolt holes so metal cannot be drawn up above the surface as the bolts are tightened.

Torquing sequence recommended by Plymouth for tightening head bolts on their V-8.



GASKETS MAKE OR BREAK JOB

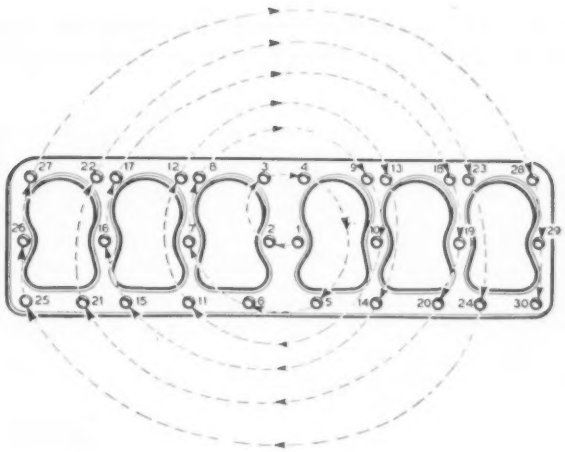
With the head and block in good condition, and with all bolts and studs cleaned up, attention should next be given to the head gasket or gaskets, which have a most essential job to do; in fact, they have three jobs to do at the same time.

They must seal the joint between the head and block against leakage of the compressed fuel-air mixture on the compression stroke, and the higher pressure and much hotter temperature gases on the power stroke. Second, they must seal against the loss of

coolant from the water passages into the cylinders, or out of the engine around the edges of the block, and third, they must seal against leakage of oil from the cylinders into the liquid passages in the water jacket, or out of the engine.

Needless to say, to do the job, and do it properly, only top quality gaskets should be used. Incidentally, some mechanics are too "thrifty" to use a new head gasket each time a cylinder head is removed . . . and to follow such a procedure is simply asking for trouble.

Before installing the gasket, examine it carefully to be certain it is the correct one—that all holes required are punched out and that no sealing ridge is creased or damaged. And while a properly designed gasket is one that can be installed without any additional coatings or cement, it is good shop practice to coat it uniformly on both sides with a light application of non-hardening gasket cement.



Tightening sequence recommended by Victor engineers in the absence of a diagram for any specific engine. (Illustration courtesy Victor Gasket & Mfg. Co.)

TIGHTENING HEAD BOLTS

With the gasket and head in place on the block, the manner of tightening the head bolts—and how tight you pull them up—is a vital matter. Some mechanics that are really "fussy" (and don't have comebacks) go over the bolts three times—they don't get in a hurry and try to do the job with one going over.

First they tighten the center bolt (bolt No. 1 in the accompanying illustrations) down to about ½ of the final torque with their speed wrench, and then tighten all the other bolts the same amount, following the tightening sequence furnished by the car manufacturers. Then, using their torque wrench, the same sequence is followed, this time bringing the bolts down to the specified torque. After the engine has been run for some time at operating temperature, all bolts are rechecked with the torque wrench and retightened if found below recommendations.

In the event a car manufacturer's recommended sequence of tightening is not available, a good sequence to follow is one recommended by the engineers of a well-known gasket manufacturer—which is to start with the stud nearest the middle of the head, and then go from stud to stud, working in a gradually increasing spiral until all studs have been tightened to the proper torque. As with the previous procedure, the studs or bolts should be tightened in three stages.

Not only is the correct tension of studs or bolts necessary to make a gas-tight, liquid-tight, oil-proof joint between head and block to seal around the cylinder bores, liquid passages and bolt holes, but it also minimizes the possibility of distorting both head and block; particularly the block with its cylinder bores and valve seats. And on overhead valve engines, improper tightening may also cause distortion of the valve seats in the head, as well as alignment and shape of the valve stem guides.

Therefore, if mechanics will make sure that cylinder heads are flat and straight, that the correct gasket is used for the given engine, and if bolts or studs are drawn up to the proper tension in the specified order, there will be very few cases of gasket failure; and come-backs due to cylinder head leakage will be kept to a minimum.

Standard-Triumph Announces Two New Cars

Two new small car models were recently introduced to the U.S. market by Standard-Triumph Motor Co.—the Triumph Sedan and Estate Wagon—which feature ease of handling and economy of operation. According to Triumph, both cars will travel a distance of about 40 miles on a single gallon of gasoline.

Triumph's new Station Wagon.

Available for both models is a newly designed push button clutch manually operated by the driver which is said to eliminate faulty gear changes as well as making stalling of the engine impossible.

The Estate Wagon features an all-steel panel body with four wind-up windows and a full size rear door. Overall length is 12′, and with rear seat folded down it provides 38 cu.ft. of storage space. The wheel base of both models is 7′, ground clearance is 6½″, height is 5′ and turning radius is 32′.

Both models are powered by a 40 h.p., OHV 948 c.c. Gold Star engine whose compression ratio is 8.0:1. Bore and stroke are 2.48″x2.992″. Top speed is 78 m.p.h.

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When Trouble Shooting the Ignition System Don't Overlook These Important Points

• IN COMMENTING on the article, "Trouble Shooting the Ignition System" (Jan. A.S.D., p. 28), the Engineering Department of the Electric Auto-Lite Co. has come up with some helpful information which we are happy to pass along.

The general impression was given that ballast resistors are used only on 12-volt systems. As a matter of fact, ballast resistors have been used on both 6-volt and 12-volt systems since 1953, though they have not been used as commonly as on the 12-volt ignition systems.

PURPOSE OF BALLAST RESISTOR

The purpose of the ballast resistor in the ignition circuit is to compensate for the normal battery voltage drop at the time the cranking motor is operating so that full ignition voltage is available at this time for easy starting.

This is accomplished on some of the late model cars by automatically bypassing the resistor while the cranking motor is in operation. This method is not used by Auto-Lite because the resistor the company furnishes has a positive temperature coefficient of resistance rather than a zero coefficient. Because of this, its low resistance allows sufficient coil current while cranking in spite of the lowered battery voltage. When the engine starts the increased current through the resistor increases its temperature so that its higher resistance reduces the current through the primary to a safe point. Since the ballast responds quickly to changes in current it restricts current flow when coil resistance is low and increases current flow when the applied voltage is low or if there is reduced time such as at high engine speeds.

GIVES MORE POWERFUL SPARK

At high engine speeds, it is well known that the current in amperes is reduced in the primary ignition circuit. This reduced current reduces the voltage drop through the ballast resistor, so that the net voltage in the system is increased somewhat. This allows more watts of energy to flow in the system and gives a more powerful spark than would be delivered without the ballast resistor.

In connection with polarity in the secondary ignition circuit, this should be negative on all current model engines, and a check for this should be made on all tune-up jobs. The polarity of the primary may be either positive or negative ground. In 1956 all the makers of automobiles who had not previously adopted the 12-volt system, did so, and also adopted the negative ground polarity. If for any reason, such as putting a battery in backwards, or reversal of polarity by the generator, the system polarity is reversed, the contact on the generator regulator will be damaged. However, the distributor contact points are both made of the same material so that they will not be affected by reversed polarity.

A fairly common practice in tune-up work is to set the distributor contact points by means of the dwell meter. When contact points are new, either the dwell meter or a thickness gauge can be used to check and adjust the setting. When the points have been in use for some time, and metal may have been transferred from one point to the other, the thickness gauge cannot be used accurately.

In this case, Auto-Lite prefers to use the dial indicator to check point opening. As a matter of practice, many shops do not have dial indicators, though every shop should have a dial indicator set, as it has

Now you can do something about ball-joints that won't "play ball"

NEW ADJUSTABLE BALL JOINT TUNE-UP KIT

A simple adjustment with an Allen wrench eliminates slack in front-end assemblies resulting from lower ball-joint looseness!

Here's the answer to car owners' complaints about *excessive tire wear* and *wobbly steering* caused by loose ball-joints.

This new Moog kit solves these problems by making Ford lower ball-joints *adjustable.* You "tune" the front-end to the exact degree of tightness desired with a twist of an Allen wrench. Positive lock prevents stud end-play. Assures perfect contact between stud head and seat *at all times.* Caster and camber cannot change due to stud movement—even while auto is in motion.

ENCOURAGES PERIODIC UNDER-CAR "TUNE-UP"

When installing the K-890, suggest to the car owner that he *return to you* for a 10,000 mile "tune-up." At that time, if needed, you can adjust out any ball-joint looseness caused by wear (and check for other needed under-car repairs). *A custom adjustment* of the ball-joint is possible, accurate to within .001 of an inch. You "tune" the ball-joint for perfect performance!

Kit K-890 is an exclusive Moog design and quality built. The steel used is 2½ *times* the thickness of the cap on original equipment. Another example of a Moog part designed and built to do a better job than the part it replaces.

See your Moog Jobber for the K-890. And find out about the many other Moog chassis and suspension parts he offers to help your shop "Get on the *BEAM*"—a new program for increasing undercar profits. *Moog Industries, Inc., St. Louis 14, Mo.*

many applications. One reason for not using the dwell meter, according to Auto-Lite, is that on some of their distributors, the dwell changes as the vacuum advance operates, and if the dwell is adjusted on the car there is danger of setting the points too close together. As there is 4° to 6° tolerance in setting the dwell, this danger can be minimized by setting the dwell at the higher figure, if no dial indicator is available.

USE CARE IN GAPPING PLUGS

The use of the plier type of spark plug gap gauge is questioned; in fact emphatically condemned by Auto-Lite, who states that the only thing that there is to recommend this tool is its convenience and speed. When the side electrode is pressed against the gauge, pressure is applied to the center electrode. If this pressure is exactly in line with the center electrode, the electrode and seal would absorb the pressure if not excessive. Most of these tools do not line up perfectly so that there is some side pressure on the insulator. Usually this is not enough to form an outright split, but it is likely to cause a flaw in the porcelain. The heating and cooling of the plug. when in use, then develops this flaw into a crack in the nose of the ceramic insulator. It is this or other improper gapping methods which cause most of the split tips which occur in spark plug operation.

IMPROPER USE OF PLUG TESTERS

In regard to using spark plug testers to sell spark plugs, most of the spark plug testers depend on a continuous current through the plug in order to observe the brilliance of the spark. Since many of the Auto-Lite spark plugs incorporate a series resistance unit, not as much current flows through the plug while testing and the plug appears to be faulty. Also, these testers do not take into consideration that used plugs have rounded ends on the center electrode and that the gaps may be wider than normal due to electrical erosion.

These factors often make a spark plug that is OK appear to be faulty, and the plug would be suitable for many more miles of service, if the end of the center electrode were filed square and the gap correctly set. The series resistance does not affect ignition as the fuel is ignited during the capacitive discharge from the electrodes, which requires only a few microseconds and could not be seen in the tester.

How to Check for Leaky Torque Converter Cooler

To verify suspicions of a leak in the torque converter cooler mounted in the bottom of the radiator, Dodge suggests, in a recent service bulletin, that the cooling lines be removed at the radiator and a pressure gauge connected to one cooler outlet. To the other, connect a source of air pressure with a shut off valve so that pressure may be trapped in the cooler. If the cooler and all fittings are leak proof, the gauge reading will remain constant.

Caution: Do not subject the cooler to more than 50 psi., and do not use pipe sealers on the gauge fitting or air fitting that will get into the transmission oil circuit.

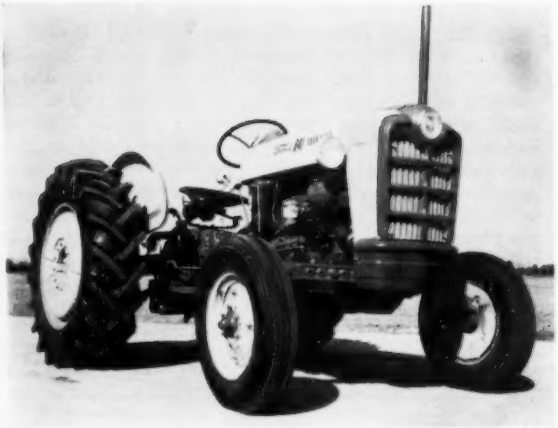
If the above check shows a definite leak, the lower radiator tank must be removed and the cooler air-tested to pinpoint the leak, which can then be repaired with silver solder. Then the transmission oil pan must be removed and inspected for water in the oil, dirty or plugged inlet screen, rust or excessive sludge.

ANOTHER MOOG EXCLUSIVE
K-890
(PATENTED)
Available now for 1957-58 Ford, 1957-58 Mercury and 1958 Edsel. Watch for other applications coming soon!
MOOG
A GREAT NAME IN AUTOMOTIVE MAINTENANCE
MOOG MEANS MORE UNDER-CAR BUSINESS!

To make your shop more profitable . . . your time more valuable . . . be sure to read this month's "These Are New" section

Ford enters diesel field with new line of tractors

New high compression diesel has maximum parts interchangeability with gasoline tractor engine.



• THE FORD MOTOR CO. has introduced its first line of American-made diesel products—a line of tractors—which are the company's answer to the time-long problem of cutting the cost differential between diesel and gasoline powered tractors so as to provide economical diesel power at minimum cost. According to the company, the price differential of the Ford diesel tractors is from 28 to 54 per cent less than the price differential of competitive tractors.

According to a company spokesman, the cost "breakthrough" came by redesigning some components of the company's high-volume gasoline four-cylinder tractor engine so that many of its parts could be used for a diesel engine.

The Ford diesels are similar in appearance to the new Powermaster models introduced last November, and all equipment in the Ford line will fit the diesel tractors without modification.

The diesel engine has a displacement of 172 cu. in., delivering 35 h.p. at the drawbar. The engine is available in two series of Ford tractors, including four models of utility and all-purpose types.

A 16:1 compression ratio, combined with the efficient direct fuel injection system, and lower fuel cost, is said to provide a saving over gasoline of approximately 40 to 50 per cent.

The injection pump is a Roosa Master opposed-piston distributor type. The Simms 4-orifice injectors spray fuel directly into the combustion chambers.

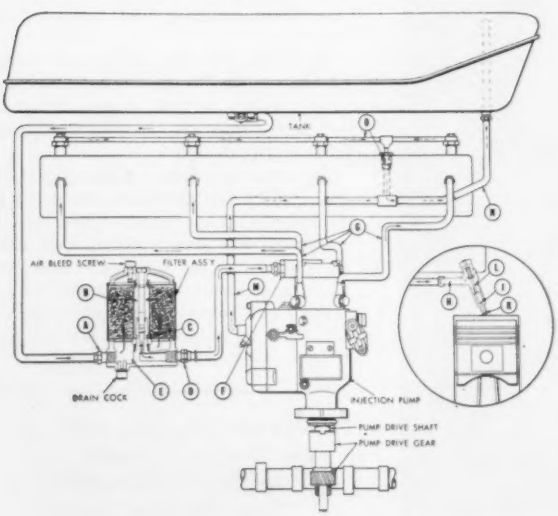
Normal starting is provided by a 12-volt electrical starter, without recourse to a special starting engine or supplemental fuel. Under extreme cold weather conditions, optional manifold pre-heaters or an ether cell may be used as a starting aid.

Although the Ford diesel and gasoline engines are similar in size and appearance, the diesel is equipped with much larger air intake, air cleaning and exhaust systems. The overhead valve type cylinder head has been designed to accommodate the fuel, air and pressure requirements of the diesel. To adapt the "Red Tiger" engine to diesel use, heavier pistons equipped with five rings, forged steel crankshaft, new connecting rods, and other special parts were designed.

Schematic view of fuel injection system. Fuel enters filter at A, passing through element B and emerging through C to outlet D. Sediment is trapped at E. Injector pump draws fuel in at F, and meters it in sequence to the four injectors through pressure tubing G.

Circular inset shows a fuel injector at compression stroke with piston at top of its travel. Fuel enters connector H and travels to points J and K on plunger L. A fluid pressure build-up occurs until tension of injector's spring can be overcome, at which time fuel is injected through four holes into combustion chamber.

Excess fuel is circulated through injector pump and injectors to lubricate these assemblies and returns to fuel tank through tubes marked M, N, and O.



Raybestos Has New Brake Service Film

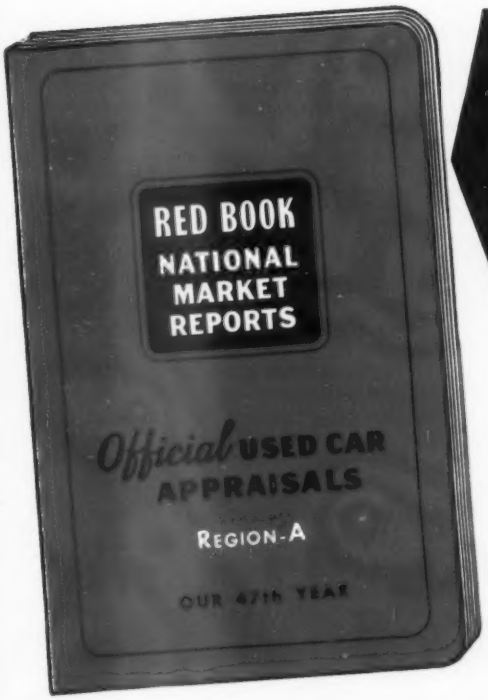
An all-new, technical sound color motion picture film has been produced by Raybestos Division of Raybestos-Manhattan, Inc. for showing at Brake Service Clinics to be held throughout the country by Raybestos distributors.

Entitled *Brakes for '58*, the film features:

1. 1958 Edsel and Mercury self-adjusting brakes—their maintenance and relining procedure.
2. Highlights of the last Indianapolis "500" Mile Race narrated by the winning driver, Sam Hanks.
3. Proper lubrication of brakes.
4. The new aluminum finned drums and their effect on braking.
5. Raybestos Liquid-Cooled Brake Film prepared by the National Association of Manufacturers for their television show, "Industry on Parade", and their "Highway Safety" series.

Those interested in seeing this new motion picture should contact their local distributor or write direct to Raybestos Div., Raybestos-Manhattan, Inc., P. O. Box 1021, Bridgeport 2, Conn.

To make your shop more profitable . . . your time more valuable . . . be sure to read this month's "These Are New" section



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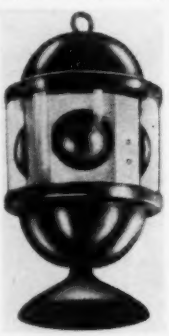
These are new *manufacturers' products*

HOW TO GET RUSH INFORMATION

If you want further information or literature describing the products shown in our "These Are New" pages, just use the handy Business Reply Card you'll find further back in this issue. Whether you want information on one or more of the products, all that is necessary is to mail this Postage paid card properly filled out to AUTOMOTIVE SERVICE DIGEST. Our Reader's Service Dept. will contact the manufacturers directly and see that you obtain the requested information as quickly as possible.

New Eye-Catcher

360° revolving light throws sixty brilliant flashes of color a minute. Called a Leader Light, it is especially designed for car dealers to draw attention to their leader cars indoors or out.



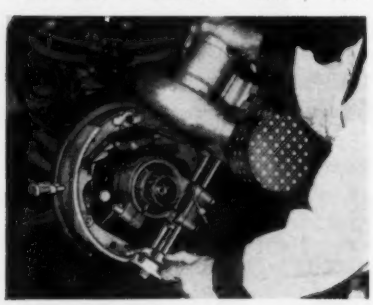
Powerful, non-staining, suction cup, fastens light to car roof in a jiffy where its brilliant beams attract instant attention from far and wide. Or it can be hung from its eye hook, or suspended from a mounting bracket that is supplied with each light.

(Use Reply Card for Further Information)

Brake Dokter Improved

Barrett Equipment Co. announces a new and improved Brake Dokter—simplified for speedy, precision brake service.

All Brake Dokter models, both



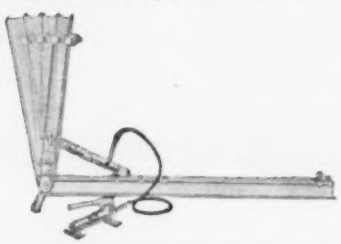
passenger and truck, are preset at the factory to grind shoes for correct fit to drum. According to the manufacturer, no special training is required for use—set the Brake Dokter drum size . . . adjust and/or centralize shoes . . . tailor lining for correct fit . . . install drum, and the job is complete.

(Use Reply Card for Further Information)

Porto-Power "Pull-Dozer"

The Porto-Power hydraulic "Pull-Dozer", recently announced by the Blackhawk Mfg. Co., is designed to pull damaged sheet metal straight out from outside the car at the exact point of impact.

Constructed of tough, heat-treated aluminum alloy, and powered by a Blackhawk 10-ton Porto-Power ram, the Pull-Dozer has two large casters for easy portability and extremely fast positioning by just one man.



Completely safe remote controlled work is said to be possible because the hydraulic ram is separated from the pump by a six-foot flexible hose. The body mechanic has absolute job control, and can place himself in the best position for observing the pulling operation.

A complete set of attachments perform an unlimited number of applications. The set includes two hooked chains, two C-clamps, bumper chain hook, pull plate and panel puller. Extreme adjustability is possible for varying hook-ups depending upon direct point of damage. All the operator need do is slide the mast clamp connected to the frame to the desired height for proper hook up.

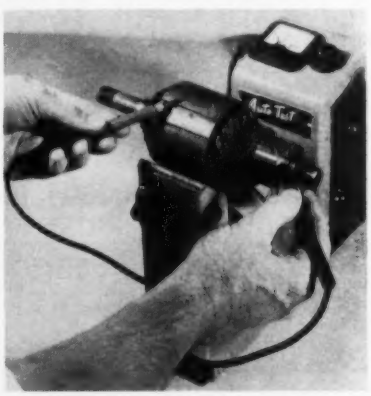
Also available is a mechanical Pull-Dozer designed for lighter sheet metal repair jobs, but using the same set of attachments as the hydraulic unit.

(Use Reply Card for Further Information)

Growler and Armature Tester

Auto-Test, Inc., announces a new, fool-proof, all-purpose growler and armature tester, designed to endow the user with superiority in "know how."

This unit is designated as "Model GAT-6" for 115 volt single phase, 50/60 cycles AC, and includes double winding which provides two different flux densities (without resistors); 115-



volt, AC, series test light; large, easy-to-read meter dial; special "bar-to-bar" 2-pronged test prod; 4-position switch for accommodating all tests; and long, neoprene-covered test prod leads.

The Unit is 4" x 10⅜" x 8⅛" high at the highest part and weighs 12 lbs. The base is equipped with 4 semi-sphere rubber "legs." The test prod and prod lead prong holders are held in the back of the unit by clamps when not in use. A wooden bumper prevents injury to the prong tips. The test light is protected by decorative grill work.

Special attention is called to the double winding which provides sufficient flux density to measure both starter and generator armature conditions—another Auto-Test exclusive.

(Use Reply Card for Further Information)

"Clik-Stop" Adjustable Wrench

The new "Clik-Stop" adjustable wrench, recently announced by the Proto Tool Co., requires no adjustment other than simply turning the knurl as in the case of an ordinary adjustable wrench. There are no lev-

ers, no buttons—as the knurl is turned, jaw openings are held fast, can't change position.

The wrench is available in 4", 6", 8", 10", and 12" sizes and is precision-made from fine alloy steel, highly polished and then chrome plated.

Absence of a corner lip on the movable jaw (in most sizes) allows a square nut to fit flat to the inside jaw surface. Better adaptability to different size nuts, including Metric & Whitworth, and elimination of "Knuckle-busting" due to slippage results from precision non-slip adjustment. Every handle is of husky I-beam construction and has a hole for convenient hanging.

(Use Reply Card for Further Information)

Fuel Regulator and Filter

Dynarex Corporation announces a new pressure control unit which is said to control pressure in the *entire fuel system* . . . nôt just at the carburetor.

With the use of this new "Injecta-Flo" unit, the entire fuel system, including the output of the fuel pump is automatically reduced in relation to the setting of the Injecta-Flo.

By controlling the entire fuel system, the manufacturer states that vapor-lock is impossible, and a smoother operating engine will result, with noticeable savings in fuel economy.

The "Injecta-Flo" control unit incorporates three important extra features. First, in addition to controlling pressure in the entire fuel system, the unit also acts as a filter. A specially designed bronze screen filters out all foreign matter that might find its way into the fuel.

Secondly, the unit is equipped with an exclusive Catylium "C" which the manufacturer states neutralizes any acid in many gasolines.

The third important extra feature is a very small "mighty midget magnet" for removing metal particles that might find their way into the fuel.

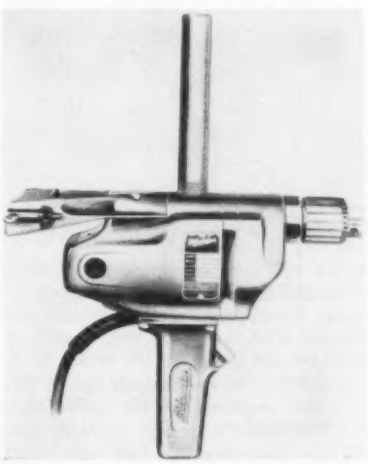
(Use Reply Card for Further Information)

½" Compact Hole Shooters

Milwaukee Electric Tool Corp. announces the addition of two new ½" Compact Hole Shooters to their heavy-duty portable electric drill line . . . Models 612 and 613.

Measuring only 12¼" and weighing 9½ lbs., both models pack ½ h.p. and deliver 7 foot pounds (Model 612) and 11 foot pounds (613) of torque at the chuck.

Under their sturdy, lightweight alu-



minum alloy housings, sealed in ball bearings, double reduction helical cut gears (Model 612) and triple reduction gearing (Model 613) combined with forced fan cooling provide smooth, quiet and dependable drilling performance. Rugged, heavy-duty power is supplied by a 6 ampere, 115 volt Milwaukee-Built AC-DC universal type motor. Spindle speeds . . . for Model 612—600 rpm . . . for Model 613—450 rpm.

Other features include . . . spade type rear handle, straight-in-line with chuck, with built-in chuck key holder . . . removable upper pipe handle . . . trigger type switch with locking button, and ½" Jacobs industrial chuck.

(Use Reply Card for Further Information)

Silicone Lubricant

A new silicone lubricant is announced by American Grease Stick Co. which is recommended by the manufacturer to silence chatters and squeaks when applied to weather-stripping, window channels, trunk

seals, rubber bumpers, and hood lacings. Because it is water propellent and freeze proof, Sil-Glyde, as it is called, is considered the ideal treatment for weatherstripping on car doors and trunks, especially to prevent weatherstripping from freezing and sticking and then pulling loose when doors and trunks are opened.

Sil-Glyde is also recommended for use on fan belts, power steering belts, all other V-belts, and speedometer cables; for brake work and new car preparation.

The manufacturer states that Sil-Glyde has high film strength, is completely weatherproof and stable under all operating conditions. It stays put, will not run or melt; is effective from 20° below zero (F.) to 400° above. The compound is 100% safe on rubber, metal, and car finishes.

(Use Reply Card for Further Information)

Battery Lifter

This 21 in. Battery Lifter clamps solidly to the outside of any type and size of 6-volt or 12-volt storage battery, and makes it easier to lift a

battery out of car, replace it, move it or carry it safely—without damaging the terminals. Although made all of steel and amply strong, the lifter weighs only about 2½ lbs.

(Use Reply Card for Further Information)

Say You Saw It In
Automotive Service Digest

These are new *manufacturers' products*

Imperial Flater-Blower

The Flater-Blower, recently announced by The Imperial Brass Mfg. Co., is an air nozzle . . . and it's an air chuck . . . all in one.

The Flater-Blower is designed for use not only for blowing dirt, metal

chips, moisture, cleaning carburetors, etc., but also it is used with the same tip for inflating tires and tubes and supplying air to any service equipment using a standard plunger-type air valve.

The new unit has a two-way nozzle with a recessed synthetic seat. This nozzle permits the unit to both blow and inflate — there are no tips to change and no second air line hose is necessary.

(Use Reply Card for Further Information)

Rocker Panel Mouldings

These rocker panel mouldings, being offered by Regal Motor Products, are said to provide the ideal answer to

many a motorist's perplexing problem of rusted, dented, unsightly rocker panels. Made of highest quality stainless steel, the telescopic mouldings fit all cars—all models—all makes.

The new mouldings come in a kit which contains everything needed for easy, quick installation, including clips and punch. The only tool required is a hammer; no drilling is necessary.

(Use Reply Card for Further Information)

Dual-Headlight Kit

Kits for up-dating '57-model Chevrolets and Fords with dual-headlamp styling and safety, as featured in the '58 models, are now available from the C. M. Hall Lamp Co.

The kits are being produced in a model for each of the two makes of cars; both models offering a choice of exterior-parts finish—either chrome or primed for painting to

match the auto in which installation is made. Each kit contains all necessary hardware, wiring with connectors attached and two pairs of dual-system bulbs.

According to the manufacturer, the only tool required for the conversion is a screwdriver, and it is stated the job can be done in half an hour. Screws holding the original equipment and wiring connections are removed, and the single-unit assemblies lifted out. Dual lamp housing assemblies are then placed in the fender openings and fastened in place with screws, using existing holes in the fender.

The new bulbs are inserted in their sockets and secured by retainer rings; the attached new wiring harness is hooked up to the terminal block, and the beams are aimed with the assemblies' built-in adjusting screws. Weather-seal plastic strips are then applied around edges of the doors, or exterior plates, and the job is completed by fastening the exterior doors in place with screws.

(Use Reply Card for Further Information)

"Plug-Master" Wrench

An exclusive flex-handle ratchet wrench designed by Champion Service Engineers for easier spark plug removal and installation has been introduced by the Champion Spark Plug Co. This "Plug-Master" wrench is adaptable to ⅜" drive spark plug sockets and extensions now in use. The 12 tooth ratchet engages with only six degree handle travel, and a hinged joint in the handle permits 30 degree movement in either direction.

The fully chrome plated "Plug-Master" wrench is available in any one of four assortments of 50 fast moving Champion spark plug types. One is an assortment of popular Champion plug types for the overall car market. The other three are specifically selected for Ford Motor Company, General Motors Corporation or Chrysler Corporation cars.

(Use Reply Card for Further Information)

Trailer Light Needs No Wire

A new combination stop, tail and license plate light "package" for utility type trailers with a completely independent and self-contained power source which eliminates the need for

any wiring connections to the hauling vehicle, is announced by the C. L. B. Co.

Called the "TraiLite," the new unit operates by its own battery and has merely to be attached to the trailer or boat transom, and a switch turned when trailer rear lighting is needed. One of its outstanding features is that it requires no adjustments or wiring connections after its attachment, and will operate at any angle.

The stoplight mechanism incorporates an exclusive type of self-leveling switch which operates by inertia. Deceleration of the vehicle-trailer causes the stoplight to flash.

(Use Reply Card for Further Information)

Nut Accumulator

Albertson & Company, Inc. announces a new Sioux Nut Accumulator, which, together with an impact wrench, can spin ten nuts off and

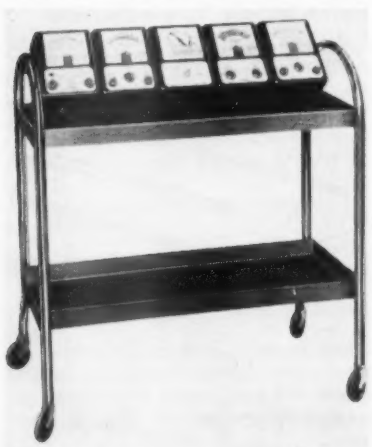
back on again without their being touched by human hand. It will hold ten ¾" or 13/16" hex nuts, either 7/16" or 1/2" thread. The center stem with its load of nuts is easily removed and another empty stem installed in its place. With the Pelican plus one extra stem, 20 nuts can be removed and replaced; with 2 extra stems, 30 nuts, etc.

The Pelican may be used with any air or electric impact wrench with ½" or ⅝" drive. It has a simple, dependable mechanism with few moving parts, and it cannot be damaged by overloading.

(Use Reply Card for Further Information)

Motor Analyzer

A complete, self-contained motor analyzer, which consists of five readily



removable testing units on a sturdy, easily-mobile stand, is announced by King Electric Equipment Co.

The test units include a coil and condenser tester, an exhaust gas analyzer, a cam angle-tachometer tester, a vacuum pressure tester and a volt-ampere-resistance tester. The V.A.R. tester is also designed to handle the 1958 dual-contact voltage regulators.

The testers are housed in glossy high-impact molded cases to withstand rugged everyday use, and they are equipped with large jeweled D'Arsonval meters with easy-to-read colored scales. The embossed operating panels clearly indicate the various tests and testing leads are of adequate length for use on all automotive vehicles.

(Use Reply Card for Further Information)

Tail Gate Loader

A 1000 lb. capacity lift gate that mounts on any make or model of ½, ¾, and 1 ton truck without cutting or alterations to the truck body is being offered by Curtis Automotive Devices Inc. It is offered in two models: Mod-

el P-1000 for express body trucks has a 54" x 28" platform and weighs only 325 lbs. Model S-1000 for stake body trucks has a 78" x 28" platform and weighs 450 lbs.

The Master Loader is said to differ from other lift gates in that the platform is raised by torque type lifting arms that lift the load straight up. Power to the gear driven arms is supplied by a hydraulic pump and cylinder combination, driven by an electric motor that operates on the truck's 6 or 12 volt system. A relief valve built into the pump protects the lift gate against dangerous overloads.

Remote controls on the side of the truck house finger tip control button for elevating load and needle valve for controlled speed descent. Load may be stopped in any position of ascent or descent at any time.

(Use Reply Card for Further Information)

Trulite Aimer Improved

The John Bean Division's new Trulite Aimer (model 1472) is made of die cast magnesium, weighs only 22 ounces, and is said to be unaffected by heat or cold.

The device is designed to check and aim the latest sealed beam lights on any make car or truck in less than one minute without removing the hood rings from the sealed beams.

The "Trulite Aimer" kit being offered consists of a pair of magnesium aimers with a compensating level; a pair of steel wall brackets; a steel, baked enamel sign, announcing the service; a handy sliderule-type checking device that shows customers the condition of their lights; a customer check pad; a calibrated line level and complete instructions.

(Use Reply Card for Further Information)

Drive-Through Car Refinishing

The new "drive-through" finishing department, recently announced by the Binks Mfg. Co., is a completely enclosed, two compartment structure with complete facilities to produce up to eight factory-quality finishing jobs a day.

The front section is a dry type spray booth; the rear compartment contains a Binks mobile infra-red drying oven. Doors between the two sections allow cars to move from the

spray booth to the drying oven without leaving the unit itself. Spun glass filters in the door and panels in the front of the spray booth prevent the entry of dust and dirt, and insure movement of clean air into the booth. Fumes and overspray from the spray booth are removed by the exhaust system.

The drying compartment contains a mobile oven equipped with 132 sealed beam infra-red lamps with built-in reflectors. Enamel or lacquer finishes can be dried and cured in 30 minutes or less, according to the manufacturer. Lamps are arranged in four banks which can be used individually or in combination for complete or partial finishing jobs.

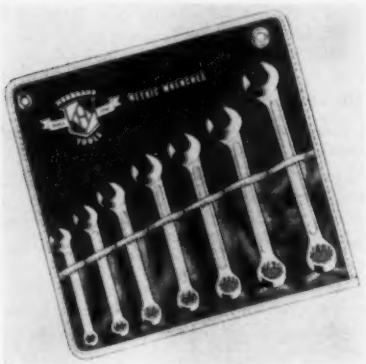
The unit measures 56'x13'8"; clearance at doors is 8'.

(Use Reply Card for Further Information)

These are new *manufacturers' products*

Metric Wrench Set

Herbrand's latest contribution to the automotive service field is this seven piece set of metric wrenches. Made of forged alloy steel and chrome



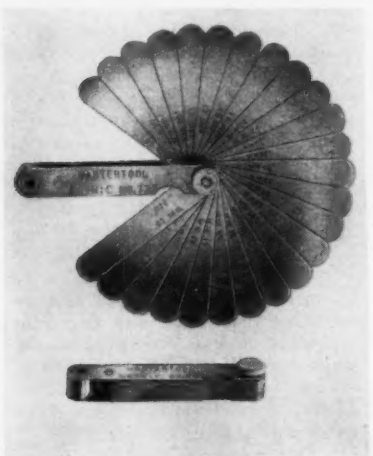
plated, they range in size from 9mm to 19mm with both 6 and 12 point openings.

"With the number of foreign cars on our highways increasing daily", said a Herbrand spokesman, "the mechanic's need for proper tools to service them is becoming acute." This basic set supplies the seven most used metric sizes. In production is a complete line of metric wrenches and sockets which will include all the types and sizes needed for efficient overhaul and repair of foreign-make cars.

(Use Reply Card for Further Information)

New Feeler Gauge

A new thickness gauge marked in thousandths of an inch and also in



metric equivalents is announced by Klopp Engineering Inc. Containing 25 thickness blades .0015 inch (.04 MM) thru .035 inch (.89 MM), the gauge has a wide range of uses for the automotive mechanics on American and foreign cars.

(Use Reply Card for Further Information)

Steering Gear Grease

Kendall Refining Co. announces a special semi-fluid lubricant for manual or power-assisted steering gears. Refined to meet General Motors specification 4673M and Ford specification M4738, Kendall's C-999 is an all-weather, extreme pressure lubricant said to overcome leakage problems and reduce wear. Now available in 8-ounce tapered nozzle tubes as well as 5-pound cans, Kendall C-999 matches the type now used as factory fill or recommended by GM and Ford for their entire lines, as well as for GMC and Chevrolet trucks. Cadillac and Lincoln specify this type for their manual models only.

(Use Reply Card for Further Information)

Power Timing Light

A completely new power timing light, which is said to permit unlimited, continuous test on 6, 12, 24 and 48-volt ignition systems and magneto

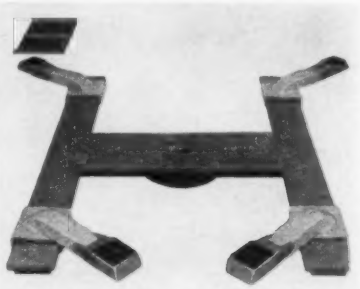
systems without danger of burned out circuits, is announced by E. Edelmann & Co. Its new super-brilliant, instantaneous stroboscopic flash is said to permit easy, positive readings in all tests, even in brilliant sunlight, and eliminate the need to compensate for time lag. The entire unit weighs only 12 ounces and is guaranteed for one year.

According to the manufacturer, only three parts can ever need replacing, and the slender body is easily opened to permit change of parts by removing only two screws. The complete circuit, with leads, is mounted on the backplate. The whole circuit can be easily removed and replaced in a few minutes by anyone. Lens, with washer and locking snap-ring can be easily replaced, and the bulb, too, snaps out or in instantly.

(Use Reply Card for Further Information)

Rotary Frame Lift

Rotary Lift Co. announces a new lift engineered to handle any make of American or foreign car—it's Frame Pick-Up model FP11, with a new superstructure capable of handling cars with standard frames, X frames,



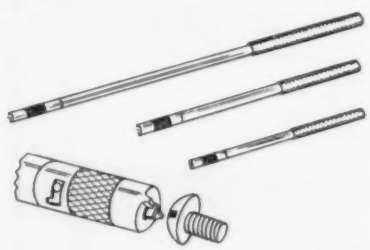
or no frames, all with equal ease. According to the company, wheel base length and width of tread, are no longer any problem.

New two-position wheel spotting dishes make it possible for shopmen, with the aid of a convenient check-chart, to spot any car from a Volkswagen to an Imperial in a matter of seconds. Four rotating pick-up arms which slide lengthwise on the two 60" long parallel runners can be brought within 3" of each other or set 71" apart horizontally. Fore and aft range of the pick-up arms is 87". These cast adapter arms, faced with tough Buna compound cushions, are mounted on sliding bases and can be placed in position quickly for safe lifting.

(Use Reply Card for Further Information)

Nylon Handle Screw-Starters

A new shockproof, nylon-handle screw-starter is announced by Owa-



tonna Tool Co. Featuring a hold-tight mechanism which tightly grips the screwhead so it cannot drop, these insulated screw-starters come in three lengths—2½", 6" and 9".

(Use Reply Card for Further Information)

Say You Saw It In
Automotive Service Digest

Top Cylinder Lubricator

A completely self-contained, auxiliary upper engine lubricating system—the Marvel Inverse Oiler—recently announced by the Emerol Mfg. Co., Inc., is designed to feed oil automatically into the high-heat, top cylinder area as it is needed most—according to engine load and speed. Op-

erating directly through the intake manifold, oil feed automatically increases at full throttle and decreases accordingly as power output declines. Oil feed adjusts automatically, to speed and load during engine operation. Once installed and adjusted, the oiler is said to require no further attention, except for refilling when the visible oil reservoir is low.

Easily installed on firewall, airduct or inside of fender on any make car or gas operated truck, the device provides oil to otherwise poorly lubricated upper engine areas to give quieter, smoother engine performance. Used with Marvel Mystery Oil, the manufacturer claims the unit lubricates sticky valves and rings, prevents compression loss and lengthens overall engine life.

Equipped with visible oil reservoir, and visible feed window, the oiler comes in either one, two or four-quart models, complete with adjustable mounting bracket. Tubing, installation parts and fittings are available in kit form.

(Use Reply Card for Further Information)

New Resistor Spark Plugs

Engineers of the Champion Spark Plug Co. have developed an improved resistor element for a new line of spark plugs to meet the requirements of the two-way radio and still insure good engine performance.

Champion's resistor spark plugs were developed to retain a more stable resistance under high operating temperatures and high voltage. This permits adequate suppression of engine noise, and at the same time offers peak performance in engine operation.

In many resistor type spark plugs rated at 10,000 ohms, resistance drops under increased engine temperatures causing radio static. The stability of the new Champion resistor is said to suppress engine static as operating temperatures increase.

The new line of plugs are identified by the prefix "X," as XJ-18Y, XJ-8, and XN-12Y.

(Use Reply Card for Further Information)

Duro Plastic Rubber

Duro Plastic Rubber, being offered by the Woodhill Chemical Mfg. Co., is a versatile black latex rubber in putty form which chemically vulcanizes

without the use of tools, heat or flame, and is said to be especially effective for waterproofing, rustproofing and insulating. Squeezed out of a tube, it can be molded to any shape and is easily applied.

It can be used to patch tire cuts, seal leaks in and around windshields and eliminate rattles and squeaks. It dries tough and elastic and is said to be unaffected by extreme temperatures. The special applicator nozzle makes an excellent spreading tool.

(Use Reply Card for Further Information)

Coated Abrasive Wheels

A new flap wheel made up of hundreds of pieces of coated abrasive cloth, with a stiffened construction which allows it to resist pressure, has been developed by Behr-Manning Co., Division of Norton Co.

The new wheel is particularly suited for use on fully automatic polishing jack operation. Also, it may be used on any standard bench grinder in place of a wire brush for the many small polishing jobs required in the repair shop, and can serve in the body shop to clean up solder jobs or rusty panels, as well as for smoothing out grit lines and swirl marks after discing.

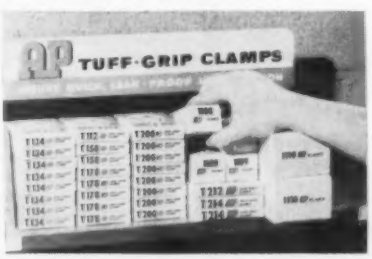
The wheel is furnished with aluminum oxide or silicon carbide abra-

sive in a wide range of grit sizes, a variety of hole sizes and in wheel sizes from 6 x 1 up to 16 x 6. Ten inch and smaller wheels are furnished with built-up disposable metal flanges. Reusable flanges are sold separately for use with the larger wheels. Each wheel is marked with an arrow to show direction of rotation, and stamped with the maximum permissible speed.

(Use Reply Card for Further Information)

Clamp Assortment

A new "Tuff-Grip" clamp assortment packaged in a free metal display cabinet is now being offered to dealers by The AP Parts Corp.



The assortment contains 35 individually packaged "Tuff-Grip" clamps covering the 12 most popular numbers. The three-color metal cabinet, which comes free with the purchase of the clamp assortment at regular price, is designed to stand on a table or shelf or to be hung on the wall.

(Use Reply Card for Further Information)

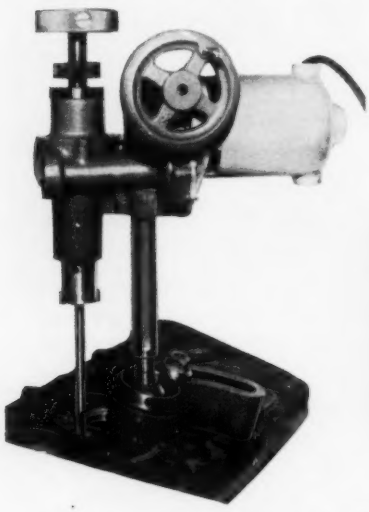
Say You Saw It In
Automotive Service Digest

These are new *manufacturers' products*

Dual Purpose Tool

With the increasing use of valve seat inserts, Hall-Toledo announces a new dual service tool to ream valve guides oversize and counterbore the head or block, prior to inserting valve seat rings.

Both operations are accomplished



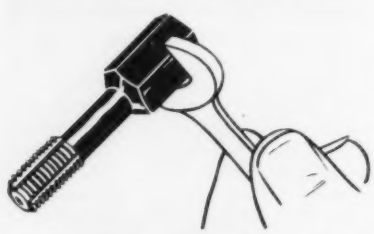
by a single machine setting. Besides simplifying valve service work, the single setting is said to assure a high degree of concentricity between the valve guide and the insert ring.

Expandable cutters permit the counterboring of any diameter within the range of the tool, with a variation of 7/8" to 3 5/16"; plus spinner and clearance blades. Design of the tool provides for accurate control at any angle up to 45° from the gasket face of the cylinder head or block.

(Use Reply Card for Further Information)

Rethreader Tap Set

A set of six rethreader taps with hex drive ends is being offered by Herbrand Division, Bingham - Herbrand Corp. which are designed for use with open end or box wrenches with or without flexible sockets or ratchets. The sets have a size range of from 1/4" to 9/16", and are available for either fine threads (No. 803) or coarse threads (No. 804). Taps are case hardened for extra long life, and plastic container has thread chart and directions on sleeve.

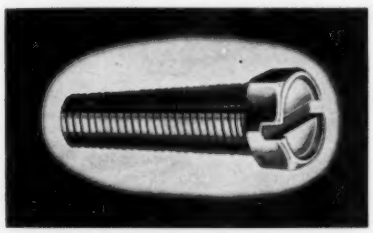


(Use Reply Card for Further Information)

Taper Plug for Casting Repair

A new type of taper plug is available from the United States Casting Repair Corp. which is said to be ideally suited for pinning or lacing cracked engine blocks, heads, valve ports, cylinders or any other automotive, industrial or marine casting.

Called "Sealace," these new plugs



have an exclusive slotted hex-head which permits tightening with either a wrench or a screwdriver so as to allow easy access to previously hard to reach places.

The plugs are made of a specially developed steel alloy which the company guarantees to withstand extremes in temperature and the pressures of expansion and contraction. Since the steel in the plugs expands at a slightly greater rate than cast iron, the plug is said to always provide a tighter fit than other types of cast iron plugs—without further expanding the crack.

The taper on Sealace plugs permits them to be tightened without channeling or other unnecessary operations, and they are said to be extremely easy to peen.

(Use Reply Card for Further Information)

Heavy-Duty Brake Fluid

Flare "400 Extra" heavy-duty brake fluid, recently announced by The Bell Co., Inc., "beats the gun" of proposed new SAE requirements. Safe from vapor lock at temperatures up to 400°F., this new fluid has particular advantage in new cars where smaller wheels reduce heat dissipation and increase the heat-up of brake fluid. This Flare formula anticipates the new SAE regulations—meets and surpasses proposed SAE 70R3 requirements.

Flare "400 Extra" flows at temperatures down to 60° below zero F. thus eliminating stiff winter brake pedal. It can be used in every vehicle, new or old, with hydraulic brakes, and, according to the manufacturer, it mixes perfectly with all fluids recommended by auto manufacturers. It is also said to be safe for all parts—it will not corrode metal, damage rubber, or form sludge or gum.

(Use Reply Card for Further Information)

Kuplex Sling Chains

The new Kuplex Sling Chain assemblies recently announced by the American Chain Div., American Chain & Cable Co., Inc., are available in single and double leg styles and in six chain sizes from 1/4" through 7/8", fabricated from Accoloy 125 material. Each assembly is marked and easily identified as to size of chain with which they are to be used. Compo-

nent parts are color-marked in orange for easy identification.

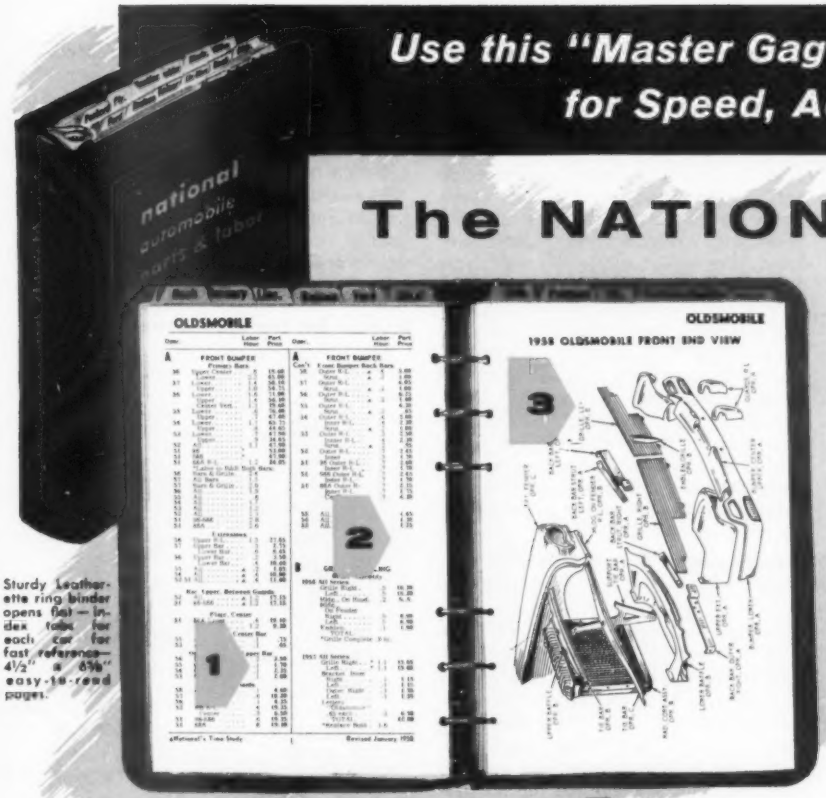
Basic components of the Kuplex Sling Chain consist of an Accoloy shaped master link which is specially designed to retain its shape under loads up to 18% greater than the standard round links, a Kupler assembly consisting of load pin and fluted stainless steel drive pin, any determined length of Accoloy chain, and an Accoloy Kuplex sling hook or grab hook. All components are thoroughly inspected and proof tested at the factory to twice the normal working load limits. In addition, the Kuplers and Kuplex hooks are magnafluxed, tested and inspected.

(Use Reply Card for Further Information)

Use this "Master Gage" for Speed, Accuracy, Profit

The NATIONAL AUTO PARTS & LABOR MANUAL

The 3-in-1 master service



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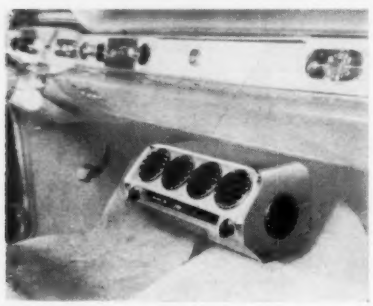
AD.

These are new *manufacturers' products*

Mark IV Auto Air Conditioner

Longer and lower, the Mark IV Monitor auto air conditioner tucks neatly under today's lower dash boards. Six louvered outlets, rotatable through 360°, give positive control of air direction. Cool air can be concen-



trated on one seat or spread evenly through the car, with especially good back seat cooling.

By turning a knob on the front of the case, the discharge air temperature may be varied as much as 30° or more on hot summer days. And once set, this new control will hold the selected temperature precisely, without fluctuation, whether the car is speeding down the highway or temporarily stopped in traffic.

For quieter operation, twin squirrel cage blowers replace the propeller type fan used on most car units. They are controlled by a rheostat switch that permits any fan setting desired.

A new exclusive feature is the Monitor Beacon, an illuminated signal on the front of the case that indicates when the clutch is on and when the unit is cooling in the proper range.

In addition to the new Monitor dash unit, Mark IV for 1958 also offers a standard dash unit, as well as a trunk unit.

(Use Reply Card for Further Information)

Rocker Arm Support Shims

Ready-to-install shims to rectify the altered dimensions between the camshaft and rocker arm assembly, which result when metal is removed

from a cylinder head, have been developed by Blaisdell Mfg. Co.

When head and rocker arm assembly are installed following grinding or milling they move closer to the camshaft an amount equal to the thousandths of an inch removed from the head.

Blaisdell's new Rocker Arm Support Shims quickly and easily allow the mechanic to compensate for this, eliminating the need of shortening valve stems, grinding push rods, or fitting hand-made shims.

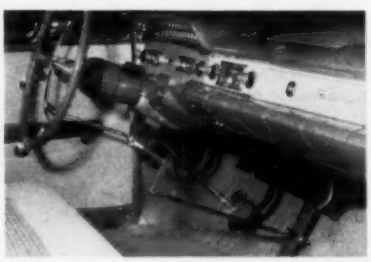
Rocker Arm Support Shims are available in complete kits for most GM, Ford and Chrysler engines in .015, .020, .030, and .040 in. thicknesses.

(Use Reply Card for Further Information)

Handicapped Driver Controls

Any make or model passenger car that is factory equipped with automatic transmission and power brakes may be easily converted to hand control by the addition of one of the new Finger-Tip Control kits recently announced by Safety-Magic Sales Co. Cars that are not factory equipped with power brakes may be accommodated by first installing the factory recommended power brake kit.

Simplicity of operation is the key-



note of the new controls, since a short movement of only one hand lever spans the range from full power to full brake. Very little effort is required to hold the lever at cruising power, yet it will return safely to neutral from either power or brake position if released. It is conveniently near the rim of the wheel so that both may be controlled with one hand on straight stretches, leaving the other hand free.

According to the manufacturer, operational hazards normally associated with handicap controls have been completely eliminated, resulting in a car that can safely be driven by other members of the family, or left with strangers for parking or service. Normal use of the pedals is completely independent of the hand lever which does not move when the pedals are used. All linkage is positioned outboard of the pedals where it does not obstruct foot operation.

The same basic design is offered in six different models depending on the quality desired, and whether for temporary or permanent installation.

(Use Reply Card for Further Information)

Metric Torque Wrenches

The increasing popularity of foreign made automobiles has brought about new service problems due to the need for metric scale torque wrenches for

a variety of engine, transmission and body applications.

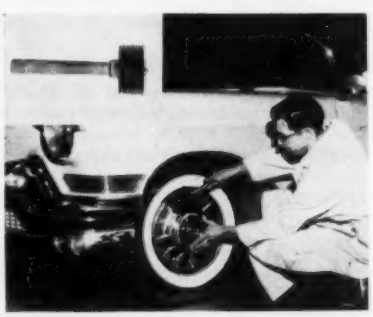
In answer to this need, the P. A. Sturtevant Co. has produced a brand new series of metric scale torque wrenches in the most popular ranges to cover the large majority of metric applications. The wrenches are available in capacities from 0-126 meter/kilograms, going as low as 0-3.5 meter/kilograms in both the sensory signalling type as well as the direct reading standard models.

(Use Reply Card for Further Information)

Cushion Roll Hammer

No, it's not a hand grenade, nor a potato masher—it's a cushion roll hammer manufactured by the John Bean Division.

Used on automotive assembly lines

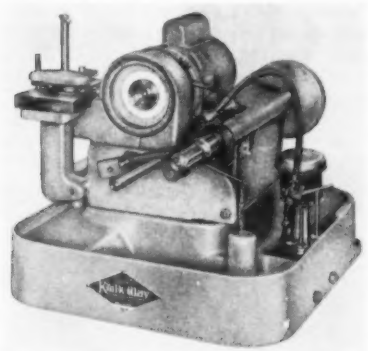


throughout the country for installing hub caps, mouldings, windshields and rear windows, the model 580 cushion roll is also a handy tool around repair shops installing glass and other materials where striking force is necessary without causing damage.

Kwik-Way Rod Master

The Rod Master has been designed by the Cedar Rapids Engineering Co. to perform the two primary operations in reconditioning the journal end of connecting rods; cap grinding and honing the journal bore to precision limits without taper or out of roundness.

The new machine incorporates a patented combination checking and facing gauge which is said to make cap grinding simple and accurate. A



5" cup type grinding wheel provides fast cutting action, and no special tools are required for wheel dressing.

Designed to recondition small or large rods with equal ease, the Rod Master features a hone employing expanding steel blades and special abrasive cloth to provide fast, accurate and economical operation.

Other features include a large honing fluid sump with settling basin; pump with independent motor, regulator valve and adjustable nozzle; foot control for honing operations; ¾ h.p., 115/230 volts, 60 cycle, single phase, totally enclosed, capacitor, ball bearing motor.

(Use Reply Card for Further Information)

Oil Pressure Gauge Set

Snap-on Tools Corp. announces a new automatic transmission oil pressure gauge set designed for testing oil pressures quickly and accurately on virtually all automatic transmissions in use today. The set (AT-67-MB) consists of two gauges, hose assemblies, quick coupler, and ten adapters—all in a specially designed, partitioned metal box.

The small gauge is calibrated from 0 to 100 p.s.i.—the range required for accurate throttle and governor pressure tests on many of the late model vehicles. The larger gauge is calibrated from 0 to 300 p.s.i. for the other required pressure tests on virtually all automatic transmissions on the road today.

Both gauges have large, easy-to-read dial faces. A hook mounted on the rear of each dial case enables the mechanic to hang the gauge in the most convenient location.

The quick coupler permits fast and easy interchange of the adapters. Of

the ten adapters furnished, three are made with ends to fit the quick coupler. The balance have various size threads to fit the connections of the different transmissions and are used in combination with the three adapters mentioned above.

A chart located in the lid of the metal box shows the various combinations used for different transmissions.

(Use Reply Card for Further Information)

Wheel Ball Bearing Adjuster

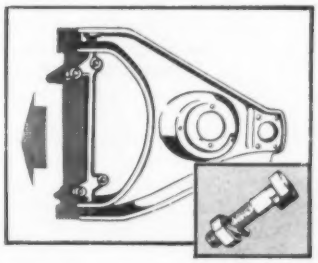
A newly developed "precision adjustment" tool, which simplifies front wheel ball bearing adjustment, is being marketed by the United Motors Service Division of General Motors through its nationwide distributor organization. The tool "measures tightness" and records the measurement on a gauge embossed on the tool itself. In replacing front wheel ball bearings to the precision tolerances required on modern cars, the mechanic simply spins the wheel and tightens the nut to mark number one on the tool. Then, he stops the wheel and backs off the nut to the zero mark on the tool. Finally (if the holes are aligned), he inserts the cotter key. If holes are not aligned, he simply backs off the nut to no more than the next slot. The new tool has been proof-tested for accuracy and durability under conditions simulating more than five years of usage.

(Use Reply Card for Further Information)

Camber Adjusting Bolt

Until now, the correction of negative camber on 1955, '56 and '57 Chevrolets has been limited by the number of shims which can be removed to increase positive camber. After all shims have been removed, further adjustment has been impossible.

To restore positive camber, Houser



Engineering & Mfg., Inc., has developed a camber adjusting bolt, the installation of which is said to permit the steering knuckle lower control arm to be moved ⅛" toward the center of the car . . . immediately increasing positive camber one full degree, so that regular shims can once again be used for final adjustment.

(Use Reply Card for Further Information)

All-In-One Power Tire Pump

International Harvester Co. announces a new deluxe spark plug tire pump for tractors, trucks, and cars,

that will fit any gasoline engine built since 1930. The pump comes completely equipped with four different spark plug thread sizes, 16 feet of long lasting flexible hose and a tire gauge with accurate 1 lb. graduations.

(Use Reply Card for Further Information)

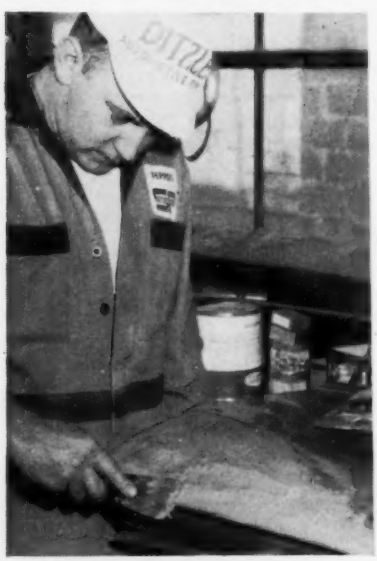
Say You Saw It In
Automotive Service Digest

Report faster plastic patching technique cutting costs in automotive body work

• NORTHEASTERN automotive shops find the combination of a quick-hardening plastic paste and a new special-purpose orbital vacuum sander to be a costs-cutting and speedy method of repairing body damage, according to Porter-Cable Machine Company, developer of the sanding unit.

Rotary disc grinders used to cut down solder fill are said to be less satisfactory for use with the plastic process; since it is easy to gouge the plastic material with the powerful grinder, and the disc throws up clouds of the light resin dust, the firm reports. The new electric sander designed specifically for the purpose, has a vacuum system with an attached bag to draw-in most of the dust.

Above: First step in the new technique is kneading together plastic paste and hardening agent. Next (below), material is buttered on damaged area of auto door; built up to slightly above adjoining surface, then is smoothed with squeegee or fine sponge.



TECHNIQUE IS POPULAR

Three basic factors account for the increasing popularity of the plastic patching process: The patch material itself is easy to handle and control; it can produce a smooth invisible patch; and when it is properly applied, it can be sanded down quickly, so that job time is reduced. Other advantages claimed are the elimination of fire hazard and burns, as well as of possible distortion of metal through overheating; and the ability to fill in holes and dents anywhere on the car body without parts removal.

The plastic paste used is a polyester resin that looks and handles like putty. It is available under a variety of trade names, packed in a can and supplied with a bottle of drying solution (also commonly known as the "hardening agent"). In making repairs, the service specialist takes the amount needed for the job from the can, and kneads-in a few drops of the drying agent. He works the mixture into the proper consistency to permit its being buttered into the rusty or damaged area (the putty should not be gopped on in a thick mass . . . since that practice simply wastes material and increases sanding time).

HARDER THAN SOLDER

After the surface of the fill is squeegeed off to a smooth surface, contoured to the body panel or section, it is permitted to cure. Within approximately 30 minutes, the chemical reaction produced by the hardening agent solidifies the plastic with practically no shrinkage. A faster drying agent, termed a "kicker," is also available. However it is not recommended for general use, because it hardens the material very rapidly—permitting less time for applying and smoothing—and produces an excessively hard fill, that extends sanding time. Once cured, the plastic is said to be harder than solder and to adhere more firmly to the metal.

Having bonded and hardened, the fill is ready for sanding, the second stage of the repair job. Porter-Cable's new unit is claimed to improve this operation greatly. It uses No. 40 grit aluminum oxide production paper to produce "an ivory smooth surface in a very few minutes," and is described as light and well-balanced.

Preparation and painting of the surface are done in the same manner as for solder, and the repair is completed. Generally speaking, it has taken less time and cost less than more widely-used methods, according to automotive service specialists who use the technique (60% either are unaware of it or have not tried it as yet, a recent survey found).

Above: Sanding down hardened plastic with special lightweight orbital unit. Below: finished door section ready for painting.

Bottom: Spray-painted and dried in usual manner, panel is replaced. The heatless method is claimed suitable for repairing holes and dents in any part of car body.

Introduce New Sunbeam Rapier Models As Stylish Family-Size Sports Cars

• FEATURING MORE POWER, improved braking and front suspension, "Americanized" styling and roomier interiors, Sunbeam's Rapier has bowed onto the domestic scene in new sports hardtop and convertible models.

Styling toward a new rakish look, Sunbeam has incorporated a new radiator grille, overall sweeping lines and slightly-flared tail fins housing rear lamp clusters. The convertible top permits full-open, full-closed and half-open "coupe-de-ville" positions.

Both models are powered by the new 91.2 cu. in. (1494 c.c.) "Rally-master" engine, which develops 73

bhp at 5200 rpm. Average fuel consumption is reported as 30 mpg; top speed, 90-95 mph. To match the increased power, the fully-independent front suspension has new, high-rated coil springs and large capacity telescopic shock absorbers. Lining area of the front brakes has been increased by 25 square inches, bringing the total car brake lining surface to 146.5 sq. in.

Body construction is the all-steel unitized type, coupled with heavy-gauge steel body panels. A new steering unit of recirculating ball unit type is said to provide lighter, more precise handling. The short, "racing stick" type gear shift has been moved to the floor, for simpler and easier shifting through the four forward speeds. Overdrive on third and fourth gears is an available option.

Padded for safety, the dashboard provides an unusually complete array of instruments. Included are speedometer; tachometer; water temperature; oil pressure and fuel *gauges;* ammeter and panel indicator lights for ignition, headlight beams, turning signals.

UNUSUAL DEBUT

In introducing the models, Rootes Motors, Inc., chose Chicago as the bow-in site, in what is thought to be the first such distinction for the Windy City. The firm pointed out in explanation that it had enjoyed a "tremendous upswing" in Midwestern sales.

Use of Wrong Circuit Breaker Causes Erratic Shifting

Should erratic shifting, or failure to shift be encountered in the Teletouch Transmission used on the new Edsel, check to see that the shifter motor relay circuit breaker is of the specified 40-ampere rating. If found to be less than the specified 40-amperes, a new one must be installed.

This circuit breaker is located adjacent to the shifter motor relay at the top of the dash panel in the engine compartment. It is connected in series by a black wire between the battery terminal of the starter and the number three terminal on the shifter motor relay.

Transmissions . . . *(Continued from page 47)*

rod to establish a 5⅝" distance between anchor points of the throttle return spring. With engine idling (*off* fast idle cam), remove all slack at vertical rod and securely tighten clamp nut. On late models, this reading has been changed to 5-7/16". Procedure remains the same.

BAND ADJUSTMENT

Kickdown Band: Loosen locknut, and back off at least 4 turns. Tighten adjusting screw to 60-70 in. lbs. Due to lack of working space, a special tool is available for this operation. After torquing, back off screw exactly three turns. Hold the screw stationary and securely tighten locknut. The three turn back off is extremely important. Use chalk, or similar marking tool, to make certain back off is accurate.

Reverse Band: Drain transmission fluid into *clean* container, and remove transmission oil pan. Remove adjusting screw locknut, and tighten adjusting screw to 20 to 25 in. lbs. Back off screw exactly 10 turns and replace locknut. Holding screw stationary, tighten locknut 30 to 35 ft. lbs. Here, again, back off is critical. Be certain the 10 turn specification is accurately performed. Replace pan using a new pan gasket, and install fluid.

Start engine and allow transmission to idle in NEUTRAL. Shift through all gear ranges. Remove dipstick, and check fluid level.

If necessary, add enough automatic transmission fluid (type A) to bring the level up to the "low" mark on the dipstick. As transmission operating pressures increase, normal expansion will raise the level to the "full" mark. Total capacity of transmission and converter is approximately 10 quarts.

ROAD TEST WILL TELL THE STORY

A thorough road test for general operation and shift pattern will reveal if adjustments have been correctly made.

Moving forward at very light throttle, the transmission should smoothly upshift at 13 to 18 m.p.h. Once in DRIVE the transmission should negotiate a kickdown upon demand of full throttle (through detent). To check, make kickdown between 15 to 20 m.p.h. *then* release to one half throttle so transmission upshifts at 25-30 m.p.h.

On 6-cylinder models make downshift check again at 30 to 40 m.p.h. Release accelerator to closed throttle. On 8-cylinder models repeat downshift check at 45 m.p.h. and release accelerator to closed throttle.

At 40 to 50 m.p.h. shift into LOW. Transmission should downshift. Shift into DRIVE at 20 m.p.h. Transmission should upshift. Coast to a stop. Transmission should downshift at 10 to 12 m.p.h.

If transmission operates smoothly and quietly according to the shift pattern; if the engine idles smoothly without creeping; if REVERSE works properly, and if the transmission generally operates satisfactorily, all adjustments can be considered accurate.

If transmission doesn't measure up to par, even if it's only slightly off, it will be to your advantage to recheck adjustments until the difficulty is corrected. It can mean the difference between the customer coming back with a complaint, or coming back for more paid labor.

Next Month: Servicing the Dynaflow.

By STOKES TAX CONTROLS, INC.

Tax guide and business briefs

√ *Family Partnerships for Family Growth*

• IF YOU ARE operating your business as a sole proprietor or if you are starting a new business, you have an excellent opportunity to create substantial tax savings in a partnership. Family partnerships are ideal means for shifting capital equities to younger members of the family. A young man could borrow at the bank on his father's guarantee, invest in a partnership, and repay the bank from earnings.

RULES HAVE BEEN CLARIFIED

Family partnerships were a favorite tax saving device during World War II and resulted in much litigation. The difficulty arose from misinterpretation of the rules and the desire of the principal owner to use the family as a tax saving conduit without relinquishing any assets. Court decisions and statute amendments have clarified the rules and a family partnership that will meet Internal Revenue requirements can be set up.

A corporation is a distinct entity and its earnings will be taxed twice, once to the corporation, and again when distributed to owners. Of course, salaries may partially relieve this disadvantage. Owners beginning business with borrowed capital assume a much heavier tax burden if they must pay their debts from funds received as dividends.

Some people attach great importance to the limited liability of a corporation. Insurance provides protection against usual business risks. The entire capital of the corporation is subject to its debts. It is a reasonable assumption that you would not operate your business until all capital had been dissipated. You would turn the key first.

If the business is already being operated as a corporation, a change to a partnership may be so costly as to eliminate the advantages. Exact calculations must be made to determine the answer.

If you can divide your income with a low tax bracket person, the saving can be very large. You cannot divide the income unless you divide the principal which is the income producer. You must part with that portion of the principal which will divest you of the desired amount of income. You must plan that you are willing to permanently divest yourself of that much assets.

Suppose Mr. Black operates a business producing $25,000 per year profit. He has a son working in the business and he wants his married daughter to have something too. A salary must be deducted from profits for services rendered and the balance must be distributed in the ratio of capital. Black decides that his services to the business are worth $6,000 per year and Black, Jr. is worth $3,600. So the profits after salaries would be $25,000 less $9,600 or $15,400. Black, Sr. decides that he will give ¼ interest each to his son and daughter and he will keep ½. As a result, Black, Sr. gets his salary of $6,000 and his partnership distribution of $7,700. The son gets salary of $3,600 and partnership distribution of $3,850 and his daughter gets $3,850.

GIFT TAX LIABILITY

If a gift is made, the question of gift tax liability arises. A married donor has available an annual exclusion of $6,000 for each donee and a lifetime exemption of $60,000. Gift tax returns are required for gifts over $3,000 to one donee. If gift tax exemptions are not available, it might be possible to sell a partnership interest to a junior member and make the down payment $6,000. Thus the annual gift could be limited to the annual exclusion.

If you want to set up a partnership along the lines stated above, have your attorney draw a memorandum of gift or a bill of sale and a partnership agreement.

The tax law will not permit income to be shifted to an inactive junior partner where the income arises from personal services. Capital must be a material income-producing factor. Capital is a material income-producing factor in most automotive businesses.

MUST BE SHOWN ON BOOKS

The investment of each partner, whether acquired by gift or purchase, must be shown on the books of the business with a separate investment account for each partner. Do not conceal the existence of partners.

The senior partner can have as much management control as would ordinarily be allowed in a partnership consisting of unrelated partners.

There is no problem in setting up a partnership with adults. If the partnership is to include minor children, have your attorney draw an irrevocable trust agreement and then make the trust a partner. The owner and his wife can be the trustees. If the trustee is not a member of the family, that will be one more favorable factor in weighing the validity of the partnership. The trustee does not have to participate in the management of the business. The family attorney might be a good trustee.

A temporary trust for a term of years is valid in shifting securities income but it will not be recognized for a family partnership. Of course, a permanent trust can be terminable when the minor beneficiaries attain majority.

PARTNERSHIP MUST BE BONA FIDE

The establishment and operation of the partnership must be handled meticulously to prove that it is bona fide. Here are a few points to watch:

1. Banks and creditors should be notified that a partnership has been formed stating the names of the partners.
2. A name implying a group is helpful such as "Harrington & Son" or "Harrington & Co." rather than "Harrington's Garage."
3. Where required, the names of the partnership and the partners

should be registered with the City Controller, County Clerk, or similar agency.

4. All contracts, leases, insurance policies, motor vehicle registrations, etc., should be written in the name of the partnership.
5. Restricting or limiting the distribution of income to partners may invalidate the partnership. Retained earnings should not exceed the anticipated capital requirements of the business.
6. A binding agreement preventing the junior partner from selling his interest may invalidate the partnership.
7. Control of essential assets in the original owner may invalidate the partnership. For instance, if the owner rents the premises to the partnership, there should be a lease to protect partnership use.
8. Any withdrawals by the junior partners for their use must be used for their benefit.
9. The tax will be affected by the wording of the partnership agreement so it should be carefully drawn. This is especially important if real estate is included in the partnership. Also the manner of distributing the assets in the event of partnership liquidation should be specified.
10. A partnership cannot adopt a taxable year different from its principal partners. A principal partner is one having 5% or more interest in income or capital.

At the close of the year, the partnership would file a U.S. Partnership Return (Form 1065) and a State Income Tax Return if required. Form 1065 is an information return and the proportionate share of each partner reported therein is reported individually on U.S. Form 1040.

There are many details in changing your method of operation. The supervision of a competent tax consultant is essential.

Paint Overspray on Wiring Can Cause Misfiring

If you run into recently overhauled engines where the paint has oversprayed onto the ignition wiring and spark plug insulators, you may be able to avoid a lot of trouble by removing it right away. Lead in the paint acts very much like shielding on the wires, and can be an important source of misfiring under load when voltage requirements are the highest.

Good, clean, insulation from one end of the ignition system to the other is essential to proper operation.

When Replacing Oil Pump Make Sure It Is Aligned

In a recent service bulletin, the Dodge Division of Chrysler Corp. advises that during engine reassembly there is the possibility that the oil pump can be tightened down in a slightly misaligned position. To properly check this, a tool should be made from an oil pump distributor drive shaft. With the gear removed and an extension suitable for a torque wrench welded on, the shaft can be inserted through the distributor opening and engaged in the oil pump.

A torque wrench should indicate a *maximum* of 10 in. oz. as the shaft is turned. Because of the gearing, the shaft should be turned at least 10 times.

If more than 10 in. oz. torque is necessary to rotate the shaft, the pump bolts should be backed off, the pump repositioned slightly, and the bolts retorqued to 35 ft. lbs. A recheck should then be made to be sure that the torque required for rotation is less than 10 in. oz. If a torque greater than 10 in. oz. is required to turn the pump shaft, it may result in oil pump driveshaft breakage.

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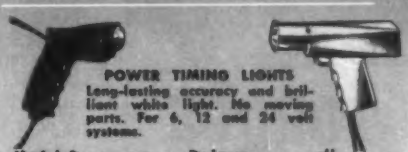

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Power Starts With A Spark . . .

(Continued from page 18)

and thrown into the scrap can, and replaced with new plugs. This is an easy way to get out of servicing otherwise useful plugs, but is expensive for the customer. If the plugs look good and the customer does not complain of engine misfiring, clean, file, and adjust the old plugs. The time involved can be charged for at the regular labor rates, but the labor cost will be considerably less than the cost of new plugs.

PLUGS NOT ALWAYS TO BLAME

Plugs have been and still are blamed on many occasions for misfiring that actually is due to high resistance, cross firing or electrical leakage in the secondary circuit which runs from the tower on the coil through the distributor, ending at the spark gap of each plug. Any defect in either the circuit or the plugs will cause unsatisfactory operation and probably misfiring. When trying to locate the trouble source it must be determined whether it is in the plugs or in the circuit.

The oscilloscope is an accurate way of doing this, as examination of the trace on the 'scope screens of various makes, and its interpretation, will tell at once whether the trouble is in the plugs, in the coil or condenser, or in the distributor contact breaker points.

The condition and voltage of the primary circuit can affect firing of the spark plug. High resistance at any of the contacts in the ignition switch or contact breaker points, may reduce the primary voltage enough to limit the available secondary voltage. This may also result in hard starting, a point to keep in mind when trying to correct the latter condition.

When new plugs are installed, the assumption naturally is that spark trouble is over, for a time at least. This cannot be counted on as a hard and fixed fact because there have been a number of cases where new or almost new plugs have been found to be misfiring, although examination of the plugs did not disclose any faults. The same plugs put into a lower compression ratio engine will perform normally. Therefore, in cases where misfiring is difficult to overcome with new plugs, try different plugs which are known to be good, in the questionable cylinders.

Plug testers are sometimes used to sell new plugs. But many service men feel that plug testers do not always give consistent and reliable results. The commonly used tester is the one using a compressed air chamber into which the plug is put so its spark can be watched and the pressure at which the plug ceases to fire noted. However, the air pressure at which the plug quits firing will be affected by atmospheric moisture, which affects the electrical conductivity of the air. Accuracy of the air gauge and variations in voltage on the plug may also affect the test. Probably the real test of plugs is in an engine. If they fire properly under load, fast acceleration, and high speed operation, they are doing the job intended.

COMPRESSION PRESSURE, PREIGNITION, DETONATION

The voltage necessary to initiate a spark at the spark plug gap, is roughly proportional to compression pressure. The high compression ratio engines normally have a high cylinder pressure on the compression stroke. The actual pressure depends on the throttle opening which in turn governs the amount of air-fuel mixture in the cylinders. Thus with wide open throttle, compression pressure is at its highest and it requires maximum voltage to produce spark at the plugs. If, after considerable use the spark plug gap becomes enlarged due to electrode decay, and the end of the center electrode becomes rounded, the required voltage may be increased as much as 30% to 40%. This added to the high voltage required because of increased compression pressure, can easily total more voltage than is available. This will cause misfiring.

The same plugs, cleaned and with center electrode filed flat and square, and correctly gapped, would probably fire satisfactorily. Thus plugs that are not actually at fault may operate unsatisfactorily, but can be made to work properly by required service.

Combustion chamber deposits that would have no appreciable effects in a 7 to 1 compression ratio engine, can result in noticeable increases in compression pressures in 10.5 to 1 CR engines, because of the reduced combustion chamber volume. One result is increased tendency to detonation. In addition, greater stresses are placed on both the high tension ignition circuit and the plugs, because both voltage and temperature requirements will increase. Preignition results in poor engine performance because the prematurely ignited air-fuel mixture brakes the pistons during the compression stroke.

Preignition occurs before the normal ignition spark. The air-fuel charge is ignited by a hot surface such as a spark plug electrode, hot tip of a spark plug insulator, hot valve head, deposits on the head or piston top, or by carbon or combustion product deposits. Detonation often is mistaken for preignition, but there is no direct connection between the two.

Preignition is sometimes progressive. It increases the negative work (opposing the normal engine forces) and the heat losses, making preignition occur earlier in the following cycle, raises the temperature of the hot spot still more.

Detonation, which is more destructive than preignition, occurs because of entirely different reasons, which have nothing to do with the spark plugs.

Consider an engine that is operating normally. The

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compressed air-fuel charge is ignited almost instantly by the spark, but burning gets under way slowly as time is required for complete burning of the cylinder charge. For example an automobile engine operating at 2000 rpm will have the spark timed somewhere around 20° before top dead center, but the crankshaft turns 9° or 10° before the pressure in the combustion chamber rises appreciably above the compression pressure.

After this delay, combustion is well established and the flame front spreads through the air-fuel charge with increasing velocity, and the heat released causes the pressure in the cylinder to rise. When the piston reaches top dead center the flame front has advanced sufficiently to burn about half of the air-fuel charge and the pressure in the cylinder rises at its fastest rate. Combustion continues at this pace until the rising temperature produces a condition of chemical equilibrium. After this, the combustion action slows down. At about 10° after top dead center the maximum firing pressure is reached and the piston is forced into the cylinder by the expanding gases until the exhaust valve opens, whereupon the pressure rapidly drops.

Consider an engine that is detonating. The first phase of combustion, kindling the fire, is exactly the same as in normal combustion. The second phase starts off the same as normal combustion, but as the flame front advances the rising pressure compresses the air-fuel charge ahead of the flame front and its temperature rises. During this period chemical changes take place making the mixture unstable. Finally auto-ignition occurs at one or more points ahead of the flame front and this highly compressed mixture in a violent explosion, bursts into flame—setting the combustion chamber gas into resonant vibrations. This produces the characteristic detonation knock.

PREMIUM FUEL SPECIFIED

Builders of many 1958 engines specify the use of premium fuel to avoid detonation. Instances are recalled where motorists used regular instead of premium fuel with the result that detonation occurred, ruining pistons and rings. These very high compression ratio engines balk on a diet of regular grade gasoline and your customers should be enlightened on factory recommendations as to the fuel to use.

Tests have demonstrated that the "explosion" pressure will get up to several times the normal when detonation takes place. This causes a severe shock effect, which if continued for any length of time causes loss of power and damage to spark plugs and other engine parts. Detonation can be reduced or prevented by having the ignition timing set at factory specification and by using the recommended grade of fuel.

Owing to the hot combustion gases passing along the spark plug body, preignition and overheating very likely will occur by omission of the gasket normally placed between the bottom of the plug shell and the plug seat in the cylinder head casting.

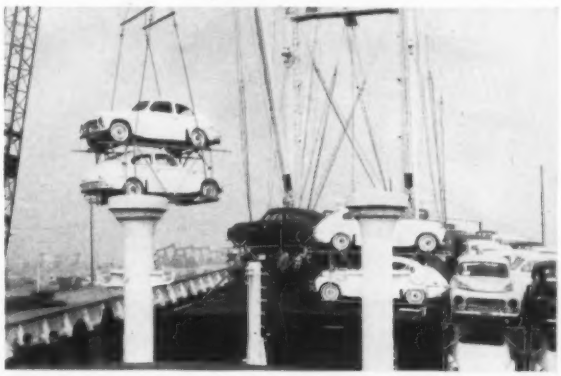
A must requirement with spark plug installation, therefore, is to make sure a new gasket is used, and also that the mating metal surfaces, which the gasket contacts, are clean.

SERVICING FOR DEPENDABLE OPERATION

A good summary to this discussion of spark plugs is found in a technical bulletin from the Ethyl Corporation which says in part:

"Factors affecting spark plug operation include the design and condition of the ignition system and spark plug, engine design, and engine-operating conditions. Most of these factors are beyond the control of the user or serviceman. However, certain precautions will help to assure dependable spark plug operations. These include selection of spark plugs of the correct reach and of the most favorable heat range for the engine operating conditions normally encountered; periodic regapping and reconditioning of the plug electrodes; proper installation of the plug; maintenance of the distributor, including the condenser and the breaker-point surface and gap; checking of the ignition coil for proper performance; and inspection of the high-tension leads for faulty insulation or inadequate spacing."

Record Car Shipment Docks in California



The largest consignment of automobiles to clear Long Beach customs to date arrived there in February, in a deal handled through the Foreign Traffic Department of American Express. Some 1008 Volvos shipped from Sweden were brought over on the maiden voyage of the M.S. Hindustan, a new ship designed especially for carrying automobiles. They involved customs totalling $107,000.00.

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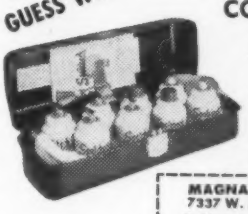

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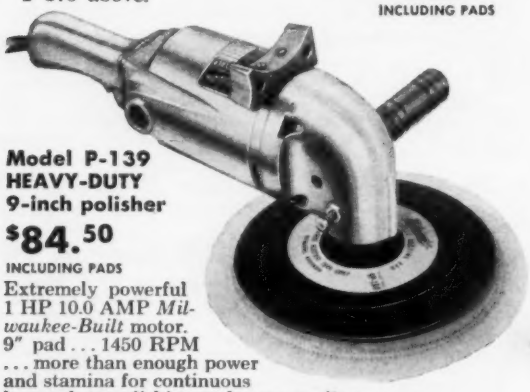

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Bear School Graduates First Class of '58

The first graduating class of 1958 at the Bear School in Rock Island included two students from South Africa, three from Canada and sixteen from the U.S.

Pictured in the first class of the year are, top row left to right: Carleton Hanson, Merrill, Wis.; Bob Atchison, Valparaiso, Ind.; Mead DeWitt, Pawling, N. Y.; Robert

Hill, Peoria, Ill.; George Morrison, Hamilton, Ontario, Canada; Robt. Burchard, Parkersburg, West Va.; Clarence Barrett, Portville, N. Y.; Robin Anderson, Bloomfontein, D. F. S., South Africa; Delmer Dioguardi, Ottawa, Ontario, Canada; Michael Mannion, Capetown, South Africa.

Middle row, left to right: Edward Kiekevers, Hull, Ia.; John Doolan, Bayonne, N. J.; Leo Sterling, Madison, Wis.; Louis Bevilacqua, Fall River, Mass.; Dan Wickham, Myers, N. Y.; Marion Van Beek, Rock Valley, Ia.; David Woodward, Goldsboro, N. C.; Roy Shay, Oxbow, Saskatchewan, Canada.

Front row, left to right: Roy Hubbard, School Instructor; Russ Adams, School Instructor; Willie Turner, Cleveland, Texas; William Rodgers, North Little Rock, Ark.; Schallie Sims, Shreveport, La.

Complete courses at the Bear School begin every other week in Wheel Alignment, Frame Straightening, Wheel Balancing, Wheel Straightening, and related subjects, with courses of one to four weeks duration offered. Further information about this interesting branch of automobile mechanics is available from the School Registrar, Bear Safety Service School, Rock Island, Illinois.

Winning Mechanics to Receive $5000 Awards for 1958 Races

For the seventh straight year, Wynn Friction Proofing will reward the unsung heroes of American automobile racing—the winning mechanics—by awarding $5,000 in cash prizes at top national races during the 1958 racing season.

Carl E. Wynn, president of Wynn's Friction Proofing, said that fifteen major race and circuit awards have been selected for the '58 season, starting with a $1200 cash award plus a diamond studded pin to the Chief Mechanic of the winning car at the "Indianapolis 500" May 30.

●

To make your shop more profitable . . . your time more valuable . . . be sure to read this month's "These Are New" section.

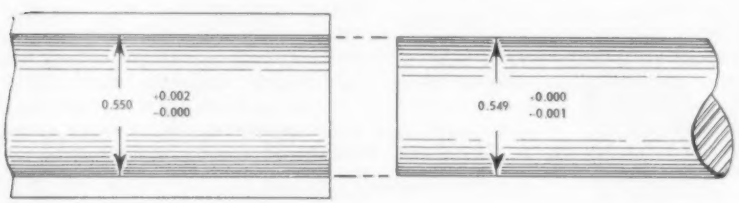
BRUSHING UP ON THOSE EASY-TO-FORGET THINGS

Refresher course

✓ *the meaning of clearance . . . tolerance*

● Because it is impossible in mass production to make parts to exactly the same dimensions, manufacturers of parts establish certain dimension variation limits called tolerances. The illustration shows, for example, the allowable tolerances of a shaft and bushing into the bore of which the shaft is to be fitted.

The diameter of the hole or bore is 0.550″, with a permissible plus tolerance of 0.002″ over the dimension 0.550″, but the hole must *not* be smaller, as indicated by the minus (—) tolerance of 0.000″.



The shaft may be made nothing (0.000″) over the 0.549″ diameter, but can be 0.001″ smaller. Thus, a running clearance is established and adequate room provided around the shaft for an oil film.

If the hole in the bushing were reamed or bored 0.002″ (permissible tolerance) larger than the dimension 0.550″ that is, 0.552″, and the shaft diameter were made 0.548″, then the running clearance becomes 0.004″. Clearance, should not be confused with tolerance since the latter is the allowable plus and minus dimensional variation of parts or clearance of parts.

Inspection and testing of quantity-produced parts is done, not so much to ascertain if they are right, as to determine by how much they are wrong. It is not practicable in commercial production to make parts which are absolutely correct in every conceivable dimension. So, limits are set for the variation from standard, the limits depending on the nature of the part and its function.

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Write to: Fram Corporation, Dept. ASD, Providence, R.I.

TESTING EQUIPMENT . . . A new 8-page, full color catalog is available illustrating the complete Hanson line of automotive testing equipment.

Write to: Harvey E. Hanson Co., Dept. ASD, Lake Blvd. at Commercial St., Paw Paw, Mich.

HYDRA-MATIC PARTS . . . Simplified Hydra-Matic Transmission parts catalog covers all Hydra-Matic transmissions from 1940 to present 1958 models and enables rapid identification of parts by means of "Service sequence selection." That is, the selection of parts is in the sequence in which service is performed . . . the unit assemblies are cataloged in the progressive order in which they are removed from the transmission. The component parts of each assembly are illustrated in exploded views, immediately followed by complete application data, thus affording easy identification and rapid selection.

Price of catalog is $2.50. Order from United Motors Service Division, General Motors, Detroit 2, Mich.

TUNE-UP TIPS . . . This 12-page booklet is designed to give mechanics tips on tune-up procedure drawn from the experience of men in the field. Entitled *Profit by Experience,* this book tells of proven ways to use tune-up tools to sell tune-up service, to locate often overlooked sources of engine trouble, and to head off customer dissatisfaction. The company believes that these tips, if carefully followed, can lead to greater tune-up profits and to bigger sales of parts and accessories as well as increased service work.

Write to: Kal-Equip Co., Dept. ASD, Box 567, Kalamazoo, Mich.

TUBE REPAIRS . . . Folder details the six easy steps for vulcanized tube repair. Each step is clearly illustrated with "action" photographs accompanied with complete explanation. One page is devoted to the replacement of valve stems and, here again, pictures and text spell out the procedures in easy-to-read form.

Write to: Dill Manufacturing Co., Dept. ASD, 700 E. 82nd St., Cleveland 3, Ohio.

EDUCATIONAL POSTERS . . . Series of posters are designed to help service shop personnel better understand the value of oil seals and the need for replacing with new seals. The colorful 9″ x 25″ posters are done in cartoon strip treatment for easier reading and have several illustrations pointing out the importance of tight oil seals to good vehicle braking.

Write to: Chicago Rawhide Mfg. Co., Dept. ASD, Elgin, Ill.

AUTOMOTIVE FINISHES . . . A 24-page, two-color, illustrated catalog of automotive finishes includes sections on surface preparation, undercoats, thinners, reducers, polishers and compounds as well as miscellaneous automotive refinishing materials and equipment.

Write to: Ditzler Color Division, Pittsburgh Plate Glass Co., Dept. ASD, 8000 W. Chicago Ave., Detroit 4, Mich.

RADIATOR FLOW CHART . . . The revised and enlarged 1958 edition of Inland's radiator water-flow table has been expanded to 28 pages and contains over 2,000 listings. The table lists the gravity water flow in gallons-per-minute for auto, truck, tractor and bus radiators as specified by the manufacturer.

Write to: Inland Mfg. Co., Dept. FC-23, 1108 Jackson St., Omaha 2, Nebr.

ROCKER PANEL REPAIR . . . Booklet gives a detailed "over-the-shoulder" view of the repair job on a rusted-out rocker panel by use of a replacement panel. Complete text describes the progressive steps illustrated in the photographs, giving detailed step-by-step instructions.

Write to: Schofield Mfg. Co., Dept. ASD, 1140 E. 222nd St., Cleveland 17, Ohio.

BRAKE SERVICE . . . This 72-page "Fleet Reliner's Manual" features practical data and charts to help the maintenance superintendent, shop foreman and mechanic in servicing and maintaining every type of brake and brake control system used on modern commercial vehicles. The manual, designed especially to aid in training new men, includes charts and descriptions of mechanical, hydraulic, air, vacuum and electric systems. Also provided are detailed "Inspection and Maintenance" directions for all basic types of mechanisms and systems found on modern highway transport vehicles.

Write to: Johns-Manville, Dept. ASD, 22 E. 40th St., New York 16, N.Y.

V-BELTS, HOSE . . . A new automotive supplement is available which contains alphabetical listings of automotive V-belt applications for all 1958 passenger cars, as well as many radiator hose applications.

Write to: Dayton Rubber Co., Dept. ASD, Dayton 1, Ohio.

SHOCK ABSORBERS . . . Entitled, "The Service Story on Shock Absorbers," this handbook is designed to simplify shock absorber installations. It illus-

You may want this information and most of it comes to you free. Just write to the name which appears following the listing and your request will get prompt attention. To be sure of getting the item you want mention that it is the one listed in AUTOMOTIVE SERVICE DIGEST.

trates proper servicing procedures, including the importance of periodic inspection of shock absorbers on air suspension cars.

Write to: United Motors Service Division, General Motors, Detroit, Mich.

GLASS SPECS . . . Complete glass specifications for all American cars and trucks and most foreign automobiles, are contained in the 112 page 1958 Shat-R-Proof Auto Glass Parts Catalog. In addition to glass specs and pattern numbers, the catalog features an interchangeable parts section, a foreign glass parts section, a safety glass area calculator, and a brief informative review of the three types of automotive glazing materials.

Write to: Shatterproof Glass Corp., Dept. ASD, 4815 Cabot Ave., Detroit 10, Mich.

SAFETY PRODUCTS . . . More than 400 different products are illustrated and described in company's latest two-part catalog . . . rear view mirrors, truck and passenger car lighting equipment, directional signals and reflectors; as well as tube and tire patches, repair equipment and supplies.

Write to: J. W. Speaker Corp., Dept. ASD, 3059 N. Weil St., Milwaukee 12, Wis.

DIESEL PARTS KIT . . . Brochure and catalog describes kits specially developed for the convenience of shop personnel servicing and rebuilding GM 71 Diesel and Gray Marine engines. Kits contain the parts most frequently required, packaged in the same assortments as actually needed on the engine for overhaul . . . eliminating the time-consuming study of parts books and annoying delays due to overlooked yet essential parts.

Write to: Kermath Engine Works, Inc., Dept. ASD, 12822 Simms Ave., Hawthorne, Calif.

ALTERNATOR SYSTEM . . . Compact in size, this system provides an ideal replacement for conventional 12-volt generator systems on passenger cars, light and medium trucks, police cars, taxicabs and other vehicles needing high output at curb idle, with greater output throughout the entire speed range. Components of the system (alternator, rectifier and regulator) are illustrated together with complete specs.

Write to: Leece-Neville Co., Dept. ASD, 1374 E. 51st St., Cleveland 3, Ohio.

TIRE CARE, SERVICE . . . The Rubber Manufacturers Association, Inc., has published a 24-page booklet entitled *Passenger Car Tires—Care and Service*, for distribution to retail outlets to acquaint them with the results of abuse and misuse of automobile tires.

Interested tire dealers can obtain single copies of the new book without charge from The Rubber Manufacturers Association, Inc., Dept. ASD, 444 Madison Ave., New York 22, N.Y.

WELDING ACCESSORIES . . . 12-page catalog illustrates and describes complete line of arc welding cable connections and accessories.

Write to: Tweco Products, Inc., Dept. ASD, P.O. Box 666, Wichita, Kans.

Calendar of Automotive Events

1958

April 23-25—1958 Spring Booth Conference of Automotive Wholesalers and Manufacturers Representatives, Bon Air Hotel, Augusta, Ga.

May 11-14—Automotive Engine Rebuilders Association Convention, Sheraton-Park Hotel, Washington, D. C.

May 26-27—NAPA National Business Conference, Sheraton Park Hotel, Washington, D. C.

May 29-31—Independent Garage Owners of California, Inc., Annual Convention, Hacienda Motel, Fresno, Calif.

June 25-29—IGO-America 1958 Convention, Statler Hotel, Los Angeles, Calif.

August 27-30—Automotive Parts Rebuilders Assn., National Convention and Trade Show, Conrad Hilton Hotel, Chicago, Ill.

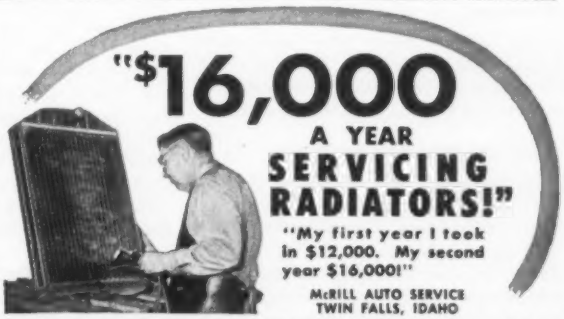
Dec. 12-16—Automotive Warehouse Distributors Assn., Inc., National Convention, Muehlebach Hotel, Kansas City, Mo.

1959

Jan. 17-25—Chicago Automobile Show, International Amphitheatre, Chicago, Ill.

WHEN CHANGING YOUR ADDRESS

Please notify us 5 weeks in advance. Supply us with both your old and new address, including address label from current issue if possible. Copies we mail to your old address will not be delivered by the Post Office unless you pay them extra postage. Mail address changes to Circulation Dept. Automotive Service Digest, 900 South Wabash Ave., Chicago 5, Ill.



MANY MAKE OVER $10,000 A YEAR! "After 3 months we are doing $850 per mo. in radiator work and increasing all the time"—Robbins Motor Co., Marlow, Okla. "Now going at rate of $18,000 a year," says Clough, Storm Lake, Ia. You, too, can do this well!

20,000,000 Radiators Need Servicing Yearly! And with today's engine power increased, cooling capacity decreased, radiators will require more service than ever! Get your share of this huge profit potential—now!

Inland, the industry's leader, offers equipment, training, Pays-For-Itself purchase plan—advertises nationally to attract radiator servicing business to Inland-equipped shops. Mail coupon for Free Book today.

INLAND MFG. CO.
1108 Jackson St., Dept. AD-4, Omaha 2, Nebr.
World's Largest Manufacturer of Radiator Servicing Equipment
"SOLD EXCLUSIVELY BY MAIL"

FREE TRAINING SCHOOL
Factory school trains you or your man quickly: Cleaning, repairing, recoring, pricing, everything! FREE to Inland customers.

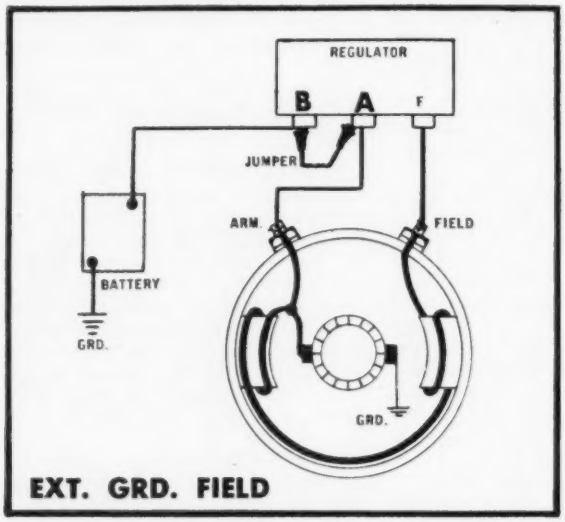
WRITE

INLAND MFG. CO., Dept-AD-4, 1108 Jackson St., Omaha 2, Nebr.
Please send new free book, "Blue Print For Profits."

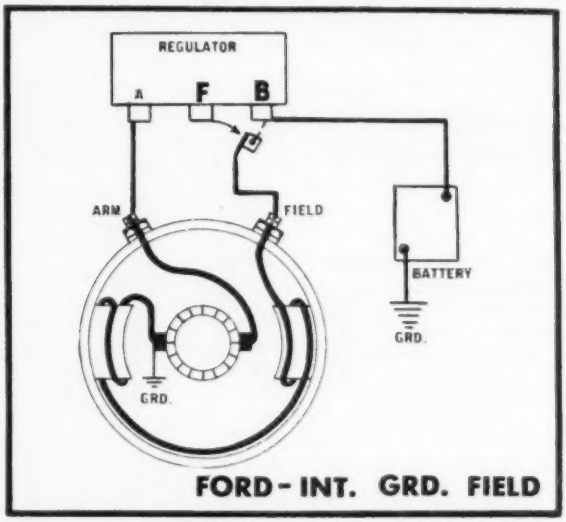
FIRM _____
(PLEASE PRINT)
ADDRESS _____
CITY _____ ZONE ____ STATE _____
BY _____ TITLE _____
If dealer, make of car sold _____
Are you now operating a radiator dept.? ☐ Yes ☐ No

Generator polarizing

• AFTER ANY GENERATOR repairs, tests or regulator adjustments, ALWAYS polarize generator on the vehicle. This is done after all leads are connected but BEFORE the engine is started. Failure to do so may result in severe damage to the equipment in charging circuit. Reversed polarity causes vibration, arcing and burning of relay contacts, discharge of the battery or serious damage to generator. *(Courtesy King Electric Eqpt. Co.)*



Connect jumper lead momentarily between "A" and "B" terminals.



Disconnect "F" lead and touch "B" term. Reconnect to "F" term.

A Budget Plan . . .

(Continued from page 43)

sarily extend credit. This permanent information, however, is helpful to the bank in speeding a decision on whether a loan is justifiable or not.

CONSIDER SEASONAL INCOMES

In the main, the foregoing discussion on time payments applies to most individuals. Special consideration should be given to individuals whose income is highly seasonal and whose reputation or character is well known. For example, farmers whose costs for labor, gasoline and oil for tractors, seed and fertilizer is great early in the growing season may be "broke" then but have plenty of money at harvest time. Never forget, however, that experienced credit men judge an applicant for credit not only upon *ability to pay* but upon *willingness to pay*. It is certainly little satisfaction to know that a man has money when some of that money that he has is rightfully yours. And the willingness to pay in the future is best indicated by his payment record in the past. This was emphasized when we were discussing the finance company report which was on the back of the application form used by loan banks.

When it comes to extending credit to business organizations as contrasted with individual motorists, it is well to keep a close eye on these accounts receivable. Business organizations that bring their indebtedness down to date on or about the first of each month can be an excellent source of shop business and profit. But the minute any organization begins getting lax on their payments and starts stretching a 30 day credit arrangement to 60 days, the storm signals are flying. And if you let such accounts run to 90 days, you are really asking for financial trouble.

SOME LOSS IS INEVITABLE

Well-run business houses simply do not abuse credit arrangements. And when arrangements are abused, such business houses are not well run. In other words, they are not the kind of customer that you can afford to continue doing business with.

Still some loss is apparently inevitable, even bankers make mistakes. Frequently, however, time deals include insurance; so that even in the event of the death of the borrower, there is no loss to the lender. And this is an especially fine arrangement since it relieves the family of the borrower of any obligation that might otherwise exist in connection with the debt.

Every shop owner realizes the importance of good men and good equipment in order to show a satisfactory profit. But many have overlooked the vital role played by sound financing. As has been said before, a good starting point is to find out now what money is available to your customers in your area for proper maintenance of their cars. With this information at hand, many a small fender repair job can just as well become a complete body refinishing job. What starts as a valve grind could become, and often should become, a complete engine overhaul or exchange. Brake reline jobs can be done really right including drum turning, grease seal replacing, and in some instances wheel bearing replacement. Front system alignment performed to protect tires against excessive wear can lead to the sale of a number of casings. Universal joint lubrication jobs can be the starting point for more expensive service that will take out destructive and annoying backlash.

"CASH ONLY" RESTRICTS VOLUME

And so it goes. The extension of credit may lead to occasional loss. But the withholding of credit and hewing to the hard-boiled edict of "cash only" will surely bring loss through a restriction in your shop volume.

This is not a plea to ease up on the drive for cash repairs. It is a warning that "cash only" will choke your profit potential. And with the financial services available in even the smallest community, there is no good reason for any shop man to try to be his own banker.

Plymouth Recommends Reversing of TorqueFlite Front and Rear Check Valve

When disassembling a Plymouth TorqueFlite transmission for servicing, the factory recommends that the position of the front and rear pump check valve be reversed in the regulator body on transmissions built before serial number 547000. On all transmissions built after this number, the orifice was omitted at the factory.

By reversing this valve, the small bleed orifice will be positioned inward against the front pump pressure port, thereby improving low and idle speed line pressure for longer front clutch life.

When reversing the check valve it is important that it seat properly on both sides and not extend above the regulator body surface. If a check valve does not seat properly, it should be replaced.

leaves no odor—cleans faster.

"I LIKE 606 BECAUSE . . .

it has no odor and does the best job of cleaning of any cleaner I have ever used. Does not injure hands and is economical to use."

Signed testimonial from Marvin E. Wallace, Service Mgr. and P.A., Anderson Motor Co., Xenia, Ohio.

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GRAYMILLS CORPORATION

3736 N. Lincoln Ave., Chicago 13, Ill.

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HE WHO LAUGHS, COME WHAT MAY,

WILL LIVE TO LAUGH ANOTHER DAY

Short circuit smiles

Seven-year-old Throckmorton, who had quite a reputation as a little terror, had just finished his first summer vacation at his grandparents' farm. Back in the city one of the neighbors asked him about his holiday and especially about his grandfather.

"Oh, he's great," responded Throcky. "We played a swell game every day. Late each afternoon he'd row me out in the middle of Claytor Lake, throw me over the side of the boat and let me swim ashore."

"Claytor Lake?" gasped the neighbor. "That's a big lake. Wasn't that a hard game for such a little fellow like you?"

"I'll say it was," said Throcky. "But the hardest part was getting out of the sack."

★ ★ ★

The baby was awakened from a peaceful slumber. Looking down at his rainment he yelled over to his father, "Dad, did you spill water on my diapers?"

"No," was the reply.

The baby looked puzzled for a moment then said, "Hm-m-m, must have been an inside job."

★ ★ ★

He: "Dear, I just insured myself for $20,000, so if anything happens to me, you and the children will be taken care of."

She: "That's nice. Now you won't have to see the doctor every time you feel sick."

★ ★ ★

"I wouldn't worry too much if your son makes mud pies," the psychiatrist consoled the woman. "And the fact that he sometimes tries to eat them also is quite normal."

"Well, I don't think so," rasped the woman, "and his wife doesn't either."

★ ★ ★

If you're calm and collected when everyone else is losing his head—maybe you just don't understand the situation.

"My job's no good. I'm always in a hole."

"What's the matter? Can't you learn to live on what you make?"

"That ain't it. I have to stick my head in a hole—and people throw baseballs at it."

"They hurt, eh?"

"Yeah, but it ain't that so much I hate. It's the people behind me throwing darts."

★ ★ ★

We hear that a fool and his money are soon parted, but please tell us, How did they get together in the first place?

★ ★ ★

Think how a mother kangaroo must feel on a rainy day when the kids can't play outside.

"Your car's coming along fine. I got a couple of good coughs out of her today!"

"I just never get tired working," was the interesting promise that appealed to the used car manager as he hired a new helper.

After an hour or so of car polishing, the manager missed his new employee. But soon he found him sleeping on the back seat of a car.

"Why did you lie to me about never getting tired?" the employer demanded.

"I didn't lie about anything. When I feel just a little weary, I take a nap so I won't get tired," came the logical answer.

★ ★ ★

The old fashioned girl blushed when she was embarrassed, but the modern girl is embarrassed when she blushes.

★ ★ ★

A Texas oilman visiting in Pittsburgh made a phone call and screamed his head off when the operator told him the charge was 60 cents.

"What!" he roared. "Back in Odessa, Texas, I could talk to hell and back for 60 cents"

"Maybe so," replied the operator curtly. "But from Odessa that would be a local call."

★ ★ ★

The nervous relatives were all gathered in the lawyer's office early, waiting for him to read Uncle Jasper's will.

The lawyer read: "Being of sound mind, I spent all my money."

★ ★ ★

Police recently sent out six pictures of an escaped convict, each picture showing a different pose of the wanted man. Shortly afterward, a well-meaning but somewhat over-conscientious sheriff in a backwoods locale sent the following wire:

"Have captured five of the critters and on trail of the sixth."

★ ★ ★

First ghost: "How'd you get that bump on your head?"

Second ghost: "I was coming through a keyhole when someone put the key in."

★ ★ ★

When a man looks a girl straight in the eye, maybe she had better do something about her figure.

★ ★ ★

Hotel owner friend of ours reports that he had a guest at his place recently who woke up everyone in the house one night screaming, "It's in the phone book! It's in the phone book!" The proprietor got the house detective and they let themselves into the man's room with a pass key.

He was in the midst of a nightmare. They aroused him and asked what was the matter. "I was having a horrible dream," said the guest, apologizing. "I dreamed the income tax people wanted to send me a big return, but they'd lost my address."

★ ★ ★

To err is human, but when the eraser wears out before the pencil, you're overdoing it.

You're DOUBLE SURE

when you call for RAMCO 10-Up SETS because only RAMCO gives you CIRCUMFERENTIAL EXPANSION* CHROME OIL RINGS for any age engine!

To restore new car Get Up and Go in *any* engine, old or new — be DOUBLE SURE — call for RAMCO 10-Up Sets!

In every 10-Up Set you get either Chrome C-9 or Chrome Spiro-Seal oil rings — whichever are best for the engine.

Both rings have years-ahead *circumferential expansion action* — oil rings to repower *any* engine — old or new. Only RAMCO gives you *both* rings for both needs!

That's why you're DOUBLE SURE you repower *right* when you specify RAMCO 10-Up Sets.

RAMCO 10 up PISTON RING SETS

RAMSEY CORPORATION, St. Louis 8, Mo.
a subsidiary of *Thompson Products, Inc.*

*LOOK! COMPARE!

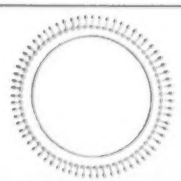
SEE WHY RAMCO'S CIRCUMFERENTIAL EXPANSION ACTION INSURES HIGH CONFORMABILITY, SIDE SEALING, SURE-FIRE OIL CONTROL.

CONVENTIONAL OIL RINGS

Conventional oil rings have inner-rings which are limited to 6 or 7 outward thrusts to seal ring against cylinder wall.

CHROME SPIRO-SEAL OIL RINGS

The RAMCO Spiro-Seal segment utilizes an exclusive, years-ahead circumferential expansion principle which insures high conformability to cylinder walls. It works like a watch spring to adjust to taper or wear. Riding *independently of piston groove depth*, it provides equalized radial pressure against cylinder wall for positive oil control.



CHROME C-9 OIL RINGS

Here is the most advanced expression of the circumferential expansion principle. This newest advancement in ring design assures a new high in conformability. With an average of 60 outward thrusts, it adapts easily to cylinder variations and variable operating conditions, in both stop and go and high speed operations.

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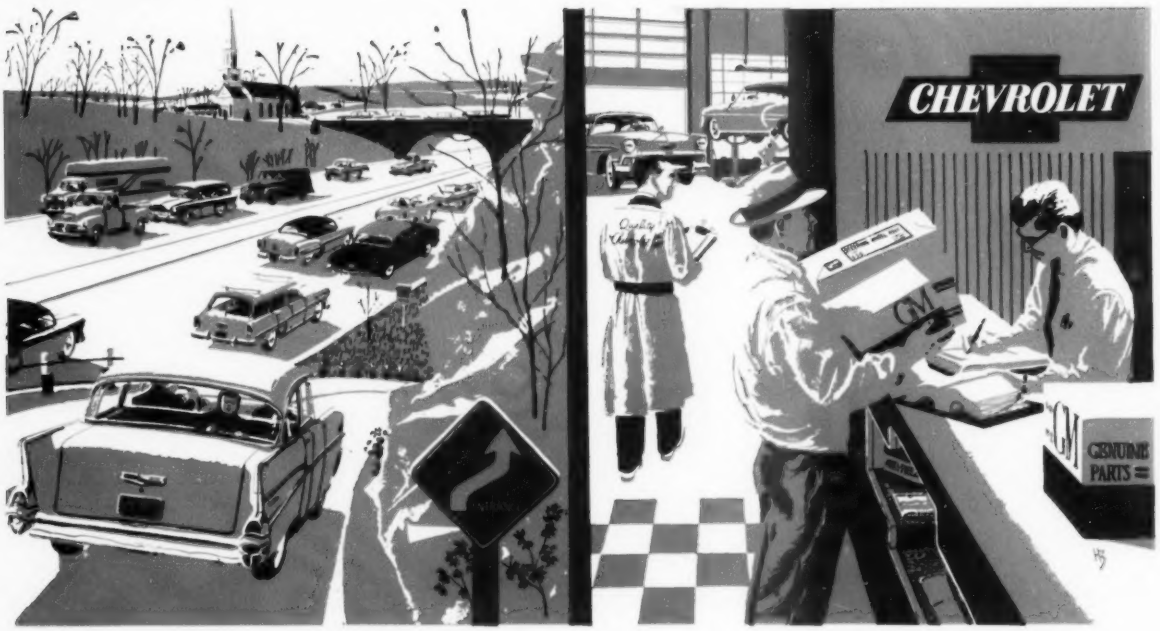
In the automotive service business...

THERE'S NO BUSINESS LIKE CHEVROLET BUSINESS!



BECAUSE...

There are over 15,000,000 Chevrolet cars and trucks on the road . . . more than any other make.

AND...

Your Chevrolet dealer can be your dependable one-stop source for genuine Chevrolet parts.

One out of every four vehicles on the road is a Chevy! That's a big service market!

Your Chevrolet dealer is ready, willing and able to help you serve that market. You can make him a convenient, one-stop source for genuine Chevrolet parts.

Genuine Chevrolet parts are made to work together . . . and made for a Chevy. They are built of the same high-grade materials to give the same dependable performance as the original parts.

Your Chevrolet dealer can offer you service aids that can help you give better and more profitable service to Chevrolet owners. . . . Chevrolet Division of General Motors, Detroit 2, Michigan.

MAKE YOUR CHEVROLET DEALER YOUR PARTNER IN SERVICE
. . . HE IS READY, WILLING AND ABLE TO SERVE YOU!

GM
CHEVROLET
GENUINE PARTS